FLIGHT
and
AIRCRAFT ENGINEER

Editorial Director G. GEOFFREY SMITH, M.B.E.
Editor - - C. M. POULSEN
Assistant Editor - MAURICE A. SMITH, D.F.C. (WING CDR., R.A.F.V.R.)
Art Editor - - JOHN YOXALL

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The Outlook

The New Research Establishment

THERE is cause for a good deal of satisfaction with the plans for the new National Aeronautical Establishment near Bedford, which were outlined last week by Sir Ben Lockspeiser and Mr. Perring. The estimated cost of £20 million will possibly appear high to many, but it may well prove inadequate. Aeronautical research has never been very generously treated in this country, and past experience has shown that in planning and designing new equipment we have always been too timid. Time and time again it has been found that actual progress in the art of flying has outstripped the wind tunnels and other apparatus available.

That has been partly due to the need for economy, but also in some measure to a certain hesitancy on the part of those responsible for the planning to take a really long view, and to design equipment of a kind and on a scale which, at the moment, may have appe..red unnecessarily ambitious. It would be fatal if the same thing should happen again with the equipment at Thurleigh.

A completely new chapter in aviation is now being written. We are, so far as the problems lying ahead are concerned, in much the same state of ignorance as that which characterized the early days of flying, with the important difference that to find the answers is vastly more difficult and expensive than it was in 1914, for instance. Then a wind tunnel with a working section of a few feet square, and with speeds of the 100 m.p.h. order, sufficed to give us the information required. At the same time, the building and testing of a full-size aircraft only cost a thousand or two, and the machine could be designed and built in a few months, so that verification of model results could be obtained very quickly.

The modern picture is very different. Where tunnel speeds of 100 m.p.h. or so could, and did, give us answers which, with a little judicious juggling with scale-effect corrections, were near enough to the truth not to run us into serious difficulties with the full-size aircraft, we must now have tunnel speeds of full-size magnitude or even greater. That means elaborate and expensive equipment, costly to build and costly to operate. But no greater mistake could be made than to try to economize on such equipment. It is not only the cost which matters. Of even greater importance is the time factor. If this country is to retain a leading position in the air (and unless it does it is finished as a world factor), it is vitally necessary that the numerous problems which now beset the aircraft designer should be solved as soon as possible. Fortunately, those responsible are, we believe, fully alive to this fact, and our scientists will, if given the necessary support, ensure that the new National Aeronautical Establishment shall have the technical means for giving the designer the answers to his queries.

Research in a Bath Tub

WHILE research into high-speed problems must of necessity be on a scale so vast as to call for a national effort, a contributor to this issue provides an amusing example of how he has obtained interesting and instructive results from gliding models in water (actually his bath tub!) One would not argue that the Ebbutt "water gliders" can compare with the new supersonic wind tunnels to be built at Thurleigh, but they have shown him, for the cost of a few shillings, what happens at the other end of the speed scale, at and near the stall. Not only so, they enabled him to find means for delaying the stall of a sharp-nosed aerofoil without the attendant increase in drag which is the price paid with an ordinary front slot. His nose flap was disregarded in this country by the highbrows, but the Germans developed much the same idea for high-speed aircraft, and their ideas accepted.

We agree with our contributor that "water gliders" could be of very considerable value in schools and train-

ing establishments. They show just what happens at the stall, and they show it very conveniently in slow-motion.

The Flying Clubs

WORKING under the greatest difficulties, the flying clubs up and down the country have gradually managed somehow to get into the air once more, as the recent tour of the chairman and secretary-general of the Royal Aero Club revealed. The keenness displayed by every one concerned is something to marvel at, and a visit to any one of these clubs is a tonic. It reminds one of pre-war days, but with this important difference that, instead of helping the clubs by subsidies, the Government is taking no interest whatever in them, unless the meagre allowance of petrol can be so regarded.

Although the relatively high rates which have to be charged if the clubs are to "break even" (they have no hope of making a profit) exclude many from realizing their ambition to fly, an ambition which pre-war Governments recognized by subsidies, this is not altogether a bad thing. Being beholden to no one, the clubs have developed a spirit of independence which is wholly admirable.

Amateur Construction

WITH an enthusiasm which one must applaud, even if one cannot share it, a contributor pleads, in an article in this issue, for a revival of amateur aircraft construction. We have felt that this viewpoint deserves to be put forward, as it is undoubtedly shared by many, but we cannot quite agree with our contributor as to the two types which he has selected: the tailless for amateur construction, and the rotating-wing type for professional manufacture.

Of all forms of aircraft the tailless configuration is the most difficult, with its tricky problems of control and stability, and there is no reason to think that it would be either easy or cheap to build. Similarly, where low cost and simplicity must be the keynote, the rotating-wing type is about the least suitable.

Henri Mignet was on the right road, but unfortunately his *Pou-du-Ciel*, in its original form, was prone to certain vices. Mignet himself cured them by certain changes in design, but the war came before the new "Flea" could be tried-out on any considerable scale. If we are to have amateur construction, the machine will have to be of the Mignet order of simplicity, although it may not look anything like his designs.

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"I hope these new mechanic meteors will prove only playthings for the learned and the idle and not be converted into new engines of destruction to the human race."—Sir Horace Walpole, 1783.

"Flight" photograph

STAR METEOR: The Derwent V turbine jets of Meteor EE 550, Sqn. Ldr. Waterton's aircraft in the speed-record attempts, being installed at Tangmere. Group Capt. Donaldson, Commanding Officer of the High-speed Flight, flies EE 549.

SHOWING the FLAG

Commendable British Enterprise : The Bristol Freighter's Tour of North and South America

The crew of the Freighter. From left to right, F. G. Burrows, aircraft engineer; Colin Richardson, co-pilot and navigator; "Tim" Sims, pilot; R. D. Paulett, wireless operator; J. D. Hannington, engine engineer.

BRITAIN'S aircraft manufacturers are occasionally accused, mostly by people at home, of lacking enterprise where foreign markets are concerned. It is to be hoped that less of this sort of criticism will be heard after the Bristol Freighter, type 170, has completed its demonstration tour through the Americas. It would be difficult to imagine a better way of bringing home to potential users in these countries the advantages which this type of aircraft can offer them.

The Bristol Freighter is undoubtedly one of the most economical aircraft ever produced. In addition it has been designed with a cargo hold of such ample dimensions (a minimum of 7ft 6in headroom and a width of 8ft between walls) that even very bulky freight can be loaded and unloaded through the very large doors in the nose of the fuselage. With a total cargo volume of 2,360 cu ft and a pay load of 4½ tons, the variety of purposes for which the Freighter can be used is obviously almost unlimited. With its simple fixed undercarriage and its very robust construction, the machine should require a minimum of upkeep, while its relatively low loading should enable it to use quite primitive airfields.

Crates being unloaded into the ample interior of the Freighter. The hold has a cargo volume of 2,360 cu. ft.

Before deciding to send a Freighter on this tour, the Bristol Aeroplane Co., Ltd., and Airwork, Ltd., made a very thorough market research, from which emerged the fact that the entire American continent offered excellent prospects. Economical air transport can give advantages which cannot be equalled by any other form, and there is good reason to expect that the tour will result in very substantial orders, to the benefit not only of the firms directly concerned but of the nation as a whole at a time when exports are a vital necessity if our standard of living is not to be reduced.

The Route Through the Americas

As for the tour itself, planned and organized by Airwork, Ltd., it covers Canada, the United States, Mexico, the West Indies, and Central and South American countries. After leaving Montreal the Freighter will visit Seven Islands, Moncton, Halifax, Boston, New York, Washington, Ottawa, Toronto, Cleveland, Chicago, Minneapolis, Winnipeg, Regina, Edmonton, Lethbridge and Vancouver.

From Vancouver the machine will fly down the west coast of the United States, stopping for demonstrations at Seattle, Portland, San Francisco, Los Angeles, and San Diego. From there the course will be laid through Mexico, Guatemala, British Honduras, Cuba, and the West Indies.

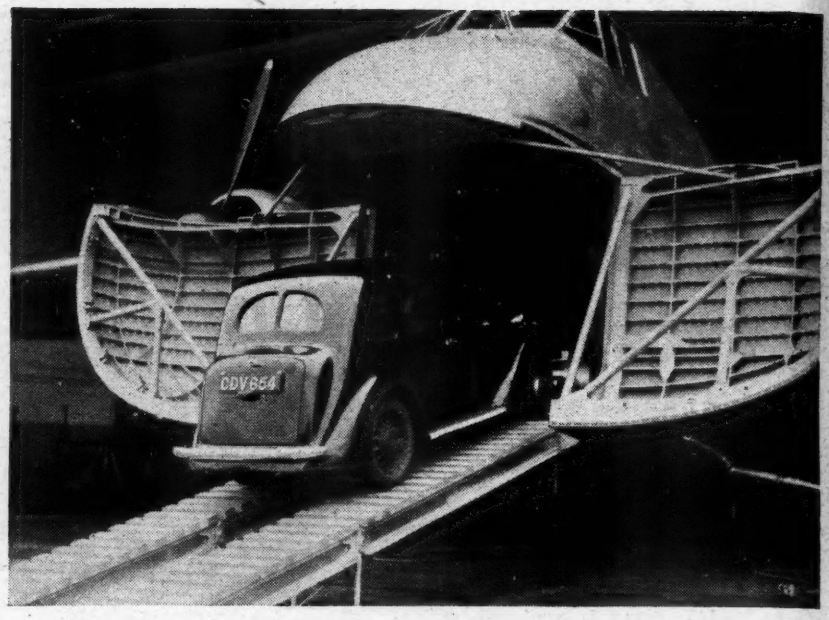
In South America the countries will be visited in the following order: Venezuela, Colombia, Ecuador, Peru, Bolivia, Chile, Argentina, Uruguay and Brazil. In each country all the most important cities will be visited and given demonstrations. It is expected that the tour will finish at Rio de Janeiro early in December.

The tour represents a co-operative enterprise, even the crew being drawn from several firms. Mr. "Tim" Sims, the chief pilot, is vice president of British Aeroplane Engines, Ltd., of Montreal, and has had extensive experience of flying in Canada, the United States and South America. Mr. C. A. Richardson, in addition to being co-pilot and navigator, is an expert on instrument-landing, and is with

SHOWING THE FLAG

the Sperry company. Mr. F. G. Burrows, aircraft engineer, and Mr. J. D. Hannington, engine engineer, have both been with the Bristol company for many years, and Mr. R. D. Paulett, radio engineer of the expedition, has spent eight years in the Marconi Marine Division and ten in the Air Division.

Among the makers and suppliers of accessories and materials used on the Bristol Freighter who are co-operating in this demonstration tour are the following: Aviation Developments, Ltd.; Dowty Equipment, Ltd.; Dunlop Rubber Co., Ltd.; Elliott Equipment, Ltd.; The Heywood Compressor Co., Ltd.; H. M. Hobson Components, Ltd.; Integral Limited, Marconi's Wireless Telegraph Co., Ltd.; Rotax, Ltd.; Saunders Valve Co.; Self-Priming Pump and Engineering Co., Ltd.; Smiths Aircraft Instruments, Ltd.; and The Sperry Gyroscope Co., Ltd.



Driving a car up into the hold of the Freighter. The doors in the nose are large enough to admit a 3-ton truck.

Reference has already been made to the payload and cargo hold dimensions of the Freighter. Other data of interest are: Low wing loading (26 lb/sq ft at an all-up weight of 36,500 lb.); range with 4-ton payload, cruising at 180 m.p.h., 700 miles; initial rate of climb on both engines 1,100 ft/min; on one engine 280 ft/min. At fully loaded weight the Freighter clears a 50ft barrier in 700 yards, with a ground run of about 350 yards. The landing distance over a 50ft barrier is 650 yards. Power is provided by two Bristol Hercules engines of 1,675 h.p. each

PREPARING AT TANGMERE

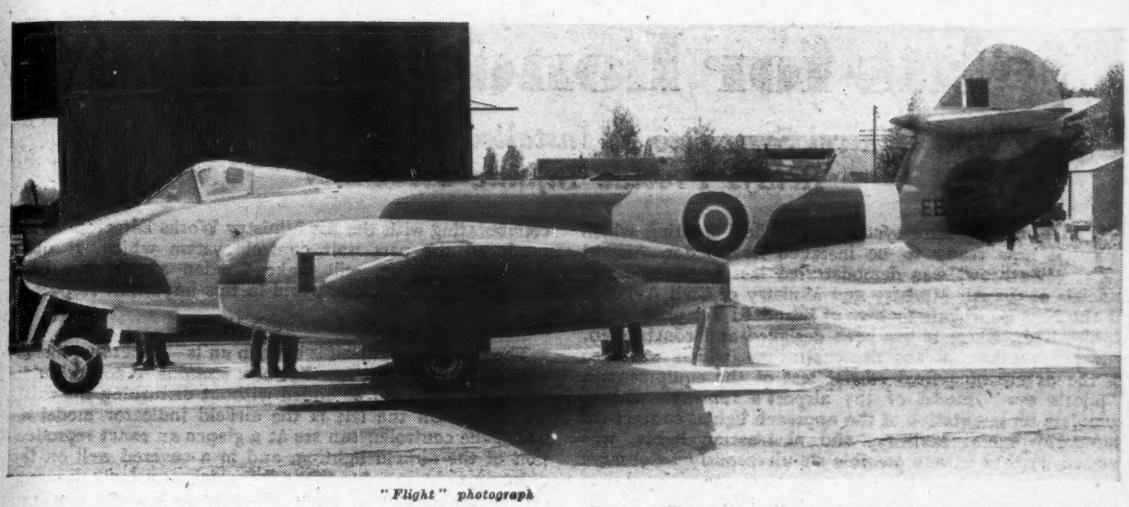
Specially Rated Derwents Installed in "Star" Meteors : Weather Defers Record Flights

THESE notes were to have been headed "Warming up at Tangmere," but as they are written this title seems the least appropriate. Meteors EE 549 and EE 550, the first to be flown on the record attempts by Group Capt. Donaldson and the second by Sqn. Ldr. Waterton, are ready to make their bids; the course markers, having defied the fury of recent storms are accurately placed; all personnel of the High-Speed Flight, from the Group Captain down, are brimming with confidence; Messrs. Turton and Worsdale, the Gloster and Rolls-Royce representatives, are satisfied; but, obstinately, even threateningly, the weather remains cold. It has already been explained that heat is essential if Group Capt. Wilson's record of 606 m.p.h. is to be beaten by a worthwhile margin—bump-free heat such as is experienced on very few days each year, even in the carefully selected South Coast area where the attempts will be made. But, at the moment, a vast mass of cold air stretches from Iceland to Northern France.

While the Met. fraternity, searching for an approaching warm spell, scan their charts and check their data in vain, preparation of the "Star" aircraft, as 549 and 550 are now known at Tangmere, is proceeding at a hot pace. During Monday and Tuesday, August 12th and 13th, High-Speed Flight personnel, assisted by a Rolls-Royce team, were engrossed in fitting the specially rated Derwent V turbine-jets in EE 549, first of the star machines to arrive from Moreton Valence. The Group Captain had decided that preparatory effort should be concentrated on 549 as he was anxious to have one aircraft fully serviceable at the earliest possible moment. By 1 a.m. on Wednesday a double crew of mechanics had completed their work on 549 and, having "adopted" this machine, Group Capt. Donaldson announced his intention—Met. permitting—of testing it during the day and of providing practice for the timing officials. For this latter purpose Sqn. Ldr. Waterton and Flt. Lt. Duke had meantime flown their "hacks" over the course.

"Flight" photograph.

Sqn. Ldr. A. L. Porter, O.B.E., Chief Technical Officer (left), confers with Mr. F. Worsdale of Rolls-Royce and Sqn. Ldr. Waterton after the first run-up of 550's Derwents.



"Flight" photograph

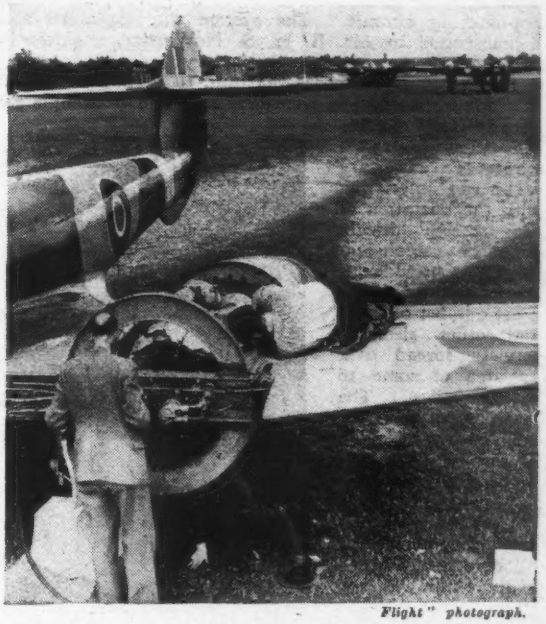
EE 549, to be flown by Group Capt. Donaldson, with its specially rated R.R. Derwents installed.

Rain fell steadily as 549 was finally polished on Wednesday morning. Preparatory activity was then transferred to 550 which had been standing in a corner of the hangar. Just before 11 o'clock, with rain still falling, Air Marshal Sir James Robb, A.O.C.-in-C. Fighter Command, circled Tangmere in a Meteor and touched down. Within ten minutes he was being shown the resplendent 549 in the shelter of the hangar. By 12.40 p.m. the sun was shining and Group Capt. Donaldson was able to take off on the maiden flight of 549, with the specially rated Derwents. After two minutes he touched down again and had brought the machine to rest without taxying to the tarmac. He climbed out and walked towards the hangar, but Air Marshal Sir James Robb and others advanced to meet him. It transpired that a small electrical fault had developed and that the fuel pressure gauges were not indicating. He explained that the trouble was of a minor nature but that he did not propose to take chances.

During the afternoon the Group Captain was off again, and while flying at 3,000 ft over the land he recorded a true speed of 626 m.p.h. for three minutes—this in a temperature of only 17 degrees C, or 13 degrees less than is hoped for.

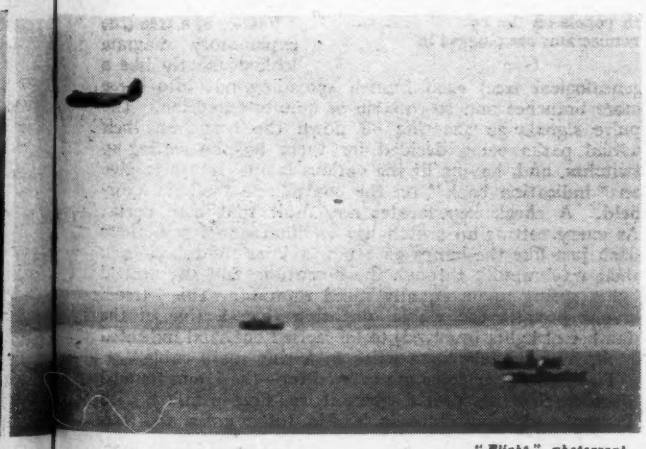
Meantime Air Marshal Sir James Robb decided that Sqn. Ldr. Waterton should attack the record after Group Capt. Donaldson and that Flt. Lt. Duke should act as reserve pilot.

On Thursday morning *Flight's* representatives positioned themselves by the western timing box. The sun shone and the air seemed reasonably warm, but we were assured by telephone from Tangmere that the temperature was about 16 degrees less than the desired 30 deg. C. Nevertheless, the circling Sea Otter and Mosquitoes foretold expectant watchers there would be flying by Meteors.



Flight" photograph.

The grass is scorched by the 4,200-lb blast from the Derwents Vs. Special concrete chocks are provided for test runs.



"Flight" photograph.

Group Capt. Donaldson takes a practice Meteor over the course in cold, bumpy conditions on the morning of Thursday, August 15th.

Group Captain Donaldson did four runs in a practice machine at what we guessed was about 590 m.p.h., but which we were assured was somewhat lower. He was followed by Sqn. Ldr. Waterton, who told us afterwards that he had been badly bumped and that on his last runs he had throttled well back. The accelerometers in the Meteors had been reading anything from +6 to −3.

These flights were chiefly impressive for the beautiful precision of the turns It must be remembered that although straight and level flying on the Meteor is comparatively easy, if sometimes uncomfortable, the turns and approaches to the 3-km speed stretch must be very accurately judged. For this reason Group Capt. Donaldson and Sqn. Ldr. Waterton deserve the highest praise.

On the morning of Friday the 16th, Sqn. Ldr. Waterton was off in EE 550, on which he pronounced very favourably after landing from a half-hour flight. His highest true airspeed was 620 m.p.h., attained in cold conditions at rather less than 3,000ft. During the day both he and his C.O. chatted with Group Capt. Wilson.

Lights for London Airport

New Unit Control System to be Installed at Heathrow : Telephone Relays Provide Infinite Flexibility

THE unit control system for airfield lighting which is now ready to be installed at London Airport (Heathrow) was demonstrated last week to senior officials of the Air Ministry and Ministry of Civil Aviation at the New Southgate factory of Standard Telephones and Cables Ltd., where it has been designed and constructed. For the purpose of the demonstration (which was also in the nature of a final official test of the equipment) a "pilot's eye" model of the airport's runways with a complete representation of the approach lights, contact (or flarepath) lights, taxiway, and obstruction lights, was erected so that it was possible simultaneously to observe the functioning of the entire system from the viewpoint of both the air traffic control officer and the pilot of the approaching aircraft. The system was explained and demonstrated by Mr. E. M. S. McWhirter, engineer in charge of remote control at the factory.

Two great requirements that had to be borne in mind in planning the system were that it should be completely flexible and capable of being extended whenever necessary without interfering with the operation of the lighting already installed. Moreover it had to provide instant control of the great number of lights and other electrical services spread over an area of some 16 square miles. The first stage of construction of the London Airport requires airfield lighting for three runways, each capable of being used in two directions, but when fully developed to nine runways, the airport will consume as much electricity as a fair-sized town. Accordingly, the power system has been planned on the basis of an 11,000-volt main ring cable fed from an outside supply over two separate routes, and with supply transformer sub-stations strategically placed as near to the load centres as possible. Present requirements are catered for by 12 of these sub-stations through which are fed some 300 lighting circuits and more than 2,000 different fittings, and 555 relay units are distributed among the dozen sub-stations and the control centre. This equipment is arranged so that the addition of new units will permit a further 40 services to be controlled from each sub-station, that is, a total of 480 additional services, and as the airport grows stage by stage from its present three runways to the final nine, extra racks and more sub-stations can be added as necessary.

QUICK AND EASY : Detachable switch panels on the control desk can be removed without tools, and connections are plugged in.

Something Entirely New

For such a lighting system the control unit obviously had to be something entirely new. No system existed which would provide the complexity of controls required with the almost instantaneous response and flexibility demanded for an airport, and after some two years' development work, Standard Telephones and Cables Ltd., collaborating with the Air Ministry Works Directorate, has produced the new unit control system which, it quite reasonably claims, will make London airport the best-equipped airport in the world in this important respect.

Extensibility

The control desk itself is built in units—something like an expanding bookcase—so that new sections to control additional runways can be added without disturbing the existing ones. On the left is the airfield indicator model on which the controller can see at a glance an exact reproduction of the airfield lighting, and in a covered well on the extreme right is a telephone by which any fault disclosed on the mimic can be reported direct to the engineer and rectified at once. On the left of the control panel is the large knurled knob for runway selection. On top is an illuminated aircraft so that error in selection is hardly possible. Wind direction and speed indicators are mounted next to the selector. Below the selector knob is the "pulse key" (of which more later) the in-pulse and out-pulse indicators, check switches, and an emergency black-out button, which we hope will never again be required. The rest of the panel is devoted to some 50 switches for "setting up" whatever combination of lights is required—lights which do not come on until the master pulse key is operated.

Briefly, this is how the system works. The master pulse key operates a series of telephone relay units, arranged rather like the branches of a tree (the explanatory diagram looked exactly like a genealogical tree) each branch spreading out into three more branches and so capable of infinite extension. The pulse signals go shooting off down the branches, their actual paths being decided for them by the setting-up switches, and, having lit the various lamps, return to give an "indication back" on the controller's "mimic" airfield. A check key locates any fault that may occur. As every setting-up switch has an illuminated top, these flash just like the lamps on a pin table as the relays click their way rapidly through the operation, and the airfield lights spring up in equally rapid rotation. The "tree" layout permits the whole operation (irrespective of the number of lights involved) to be carried out, and indicated back, over 12 telephone wires in a ring main cable.

Two lighting systems are catered for—the Drem (named after the Scottish airfield where it was first installed) with filament and sodium funnels, lead-in, totem poles, and wartime R.A.F. type flarepath lights; and a later straight-approach type comprising high and low intensity approach lights, and high intensity flarepath (or contact) lights. Other lights, such as glide-path indicators, flood lights,

obstruction, taxying and traffic lights are, of course, common to both systems.

A final point worth mention is that the circuits making up the approach and contact lights are grouped as "flare-path services" and are interlocked and co-ordinated in the switching system by the runway selection knob, thus making certain that only those lights which are required for a given approach path can be illuminated at one time. The rest can be operated individually and irrespective of the runway selected. The taxying lights are used to mark the route of the aircraft turning off the runway to its unloading bay.

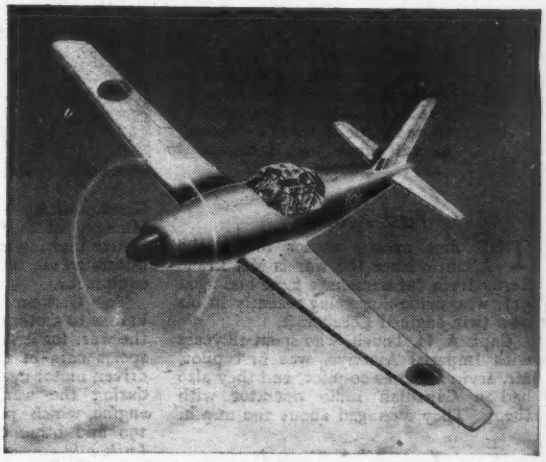
This unit control system will ultimately be installed on other British airfields, and is to become the standard equipment. It is also hoped to get it accepted internationally—even by Russia!

Turbine-Airscrew Trainer

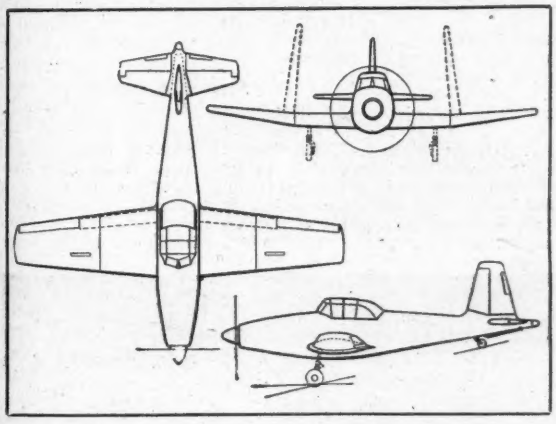
Boulton Paul P.108 with Rolls-Royce Dart or Armstrong-Siddeley Mamba

IN recent years Boulton Paul Aircraft, Ltd. have produced comparatively few types of aircraft but these, without exception, have been of outstanding interest and significance. Many years before the war the Sidestrand, and even earlier types, showed how fast and manœuvrable a twin-engine bomber could be made. The Overstrand, successor to the well-loved Sidestrand, demonstrated the potentialities of defensive gun-turrets on large bombers, and the Defiant was the first fighter in which the entire armament was concentrated in a turret. In *Flight* of June 20th this year some details were given of a projected twin-engine turret fighter of ingenious design and high performance, and it has now become possible to refer to the latest Boulton Paul design concerning which enthusiastic whispers have circulated for some months in privileged circles.

Bearing the Boulton Paul type number P.108 the new machine is the first trainer to be powered by a gas turbine unit. It is suitable for flying instruction by day or night, for navigation, gunnery and bombing training and for glider towing. Folding wings and good vision from the cockpit render it eminently suitable for carrier operation. Service personnel will be interested to learn that a third seat, behind the side-by-side positions for the instructor and pupil, is provided for a navigator or passenger. Thus it may safely be predicted that, apart from providing facilities for instructing air-crew destined to operate military types now projected, the P.108 will be the means of introducing many prospective "passengers" to the vibrationless flight made possible by the gas turbine.



Although conventional in appearance, the Boulton Paul P.108 trainer marks an important new step in the development of military training aircraft. It has side-by-side seats for instructor and pupil and a third seat behind them.



The power unit may be either a Rolls-Royce Dart or an Armstrong-Siddeley Mamba, driving a constant-speed airscrew, the thrust of which will be augmented by jet exhaust. The jet outlet is not visible in the accompanying drawing but is located beneath the fuselage, offset from the centre line.

It is to be hoped that preliminary details of the new Rolls-Royce and Armstrong-Siddeley power plants, both of which will obviously be suitable not only for trainers like the P.108 but for the smaller sizes of transport aircraft, will soon be released.

Of all-metal construction the P.108 is fully aerobatic and is claimed to have manœuvrability "of single-seat fighter standard." The span is 39ft 4in (21ft 1in folded), length 34ft 4in and height 11ft 10in.

AMERICA'S NEWEST "JETS"

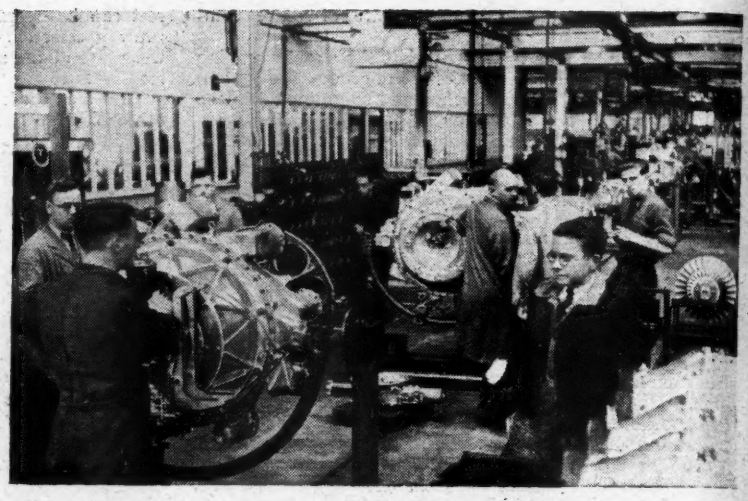
FIVE types of multi-jet bomber are being developed for the U.S. Army Air Forces: the North American XB-45, Consolidated-Vultee XB-46, Boeing XB-47, Martin XB-48 and Northrop XB-49. Of all but the Northrop little or nothing has been disclosed, but the XB-49 is officially stated to be a jet-propelled development of the XB-35 "flying-wing," now flying with piston engines. The five new bombers are additional to the Douglas XB-43, already referred to in *Flight*, which is powered by two of the new General Electric TG-180 axial-flow turbine-jets of unspecified thrust.

New single-jet fighters include the Curtiss-Wright XP-87, North American XP-86 and the Northrop XP-79B. A photograph of the latter appeared in *Flight* of August 1st, 1946. The pilot lies prone and the power units are two Westinghouse 19-B Yankees; these, like the TG180, are of axial-flow type.

The U.S. Army has also permitted reference to the Bell XS-1 supersonic research aircraft which has already been flown without its rocket power unit. A special pressure suit has been developed for the pilot because the machine is expected to attain 80,000ft. The pilot's ejector seat is fired by a 37 mm shell, which accelerates pilot and seat to 40 m.p.h. in a distance of 5ft.

A second automatic charge releases the shoulder and seat straps, and the parachute—of special "ribbon" design—is opened at a prescribed altitude by an aneroid device.

HERE AND THERE



DERBY WINNERS : Derwent V jet engines on the production line at the Rolls-Royce Derby factory. The standard thrust is 3,500lb. but those for the Meteor IV "record" aircraft have been increased to 4,200lb. thrust.

First Across

THE first private owner to fly the Atlantic since the war is Mr. Leslie Leroy Irvin (of parachute fame and aged 51), who made a crossing recently in his own twin-engined Beechcraft.

Capt. A. H. Touell, who spent 18 years with Imperial Airways, was first pilot, Mr. Irvin acted as co-pilot, and they also had a Canadian radio operator with them. They averaged about 200 m.p.h.

Test Pilot Filmed

CAPT. STONE, test pilot for B.O.A.C., has "gone into pictures."

He appears in a "New Pathé Pictorial" feature which deals with the testing of reconditioned Sunderlands after conversion to civil flying boats, and is seen making a routine test flight over the English Channel. Incidentally, some of the sea and landscapes over the English coastline are extremely attractive, too.

B.M.W. Plant for Sale

THE famous B.M.W. factory at Munich, which employed nearly 9,000 workers before the war, is among the seventeen German plants allocated to Great Britain as reparations, and the Ministry of Supply has issued a Press Notice inviting enquiries from any party interested in acquiring its plant and equipment.

This German firm was among the best known to motorists in this country before the war, for it produced one of the finest sports cars in the world, and a shaft-driven motor cycle of equal quality, and, during the war, the B.M.W. aircraft engine which powered the Focke-Wulf 190 and other first-line aircraft of the *Luftwaffe*.

Sign of the Times

STRANGE how it is often the smallest and least significant things in life which periodically illustrate the return from war to peace!

Last week the name "Berlin" appeared for the first time since September, 1939, on the destination board beside a civil aircraft on a British airfield—a trifle which drew comment from nearly everyone who saw it.

The aircraft was one of British European Airways which left Northolt on a proving flight to the German capital via Hamburg. It was piloted by Capt. P. Liver and carried a crew of four but no passengers. It is expected that a regular commercial service between London and Berlin will soon be resumed.

Rally at Radlett

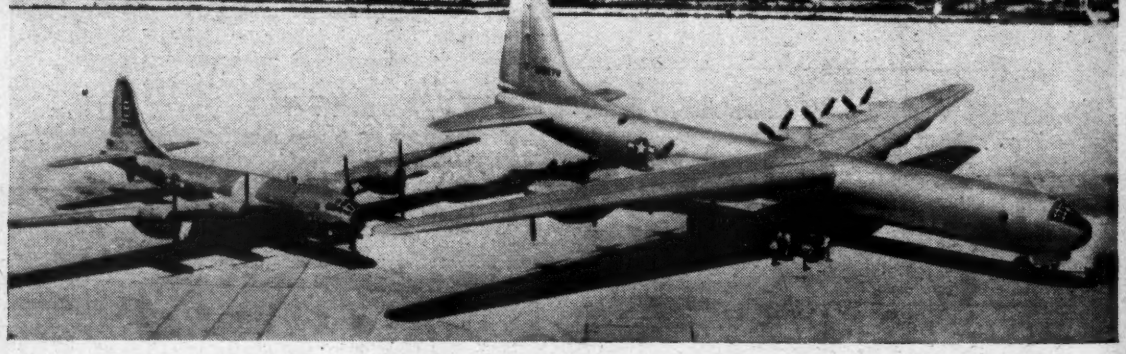
A "CONCOURS D'ELEGANCE" followed by flying contests for rubber-powered models, sailplanes, and petrol-driven models (in that order) will comprise the day's programme at the Handley Page Airfield, Radlett, next Sunday, when the St. Alban's Model Aero Club holds its "All Herts Model Aircraft Rally."

The meeting starts at 11 a.m. and the Mayor of St. Albans is to present the trophies and other prizes at 6.30 p.m., so, given the same sort of weather as blessed the Bowden International Trophy event at Heston, it should be an attractive day out for all concerned, especially as the rally is open to all-comers.

Model Airfield

WHILST on the subject of models, this is "International Week" at Eaton Bray Sportsdrome, the first airfield in the world (so the sponsors claim, thereby trailing a coat for the American aeromodellers) devoted exclusively to model aircraft enthusiasts.

This unique airfield covers 76 acres



DWARFED GIANT : Seen beside the 100 ton Consolidated-Vultee B-36 with its 230ft. span and 163ft. fuselage, the B-29 Superfortress looks quite a modest machine. The six Wasp Majors of the B-36 produce 18,000h.p. as compared with the 8,800h.p. of the B-29's four Cyclones.

HERE AND THERE

and has everything laid on for the convenience of its patrons—mobile control tower, concrete take-off areas, windsocks, workshops, accessory shop, refreshment shop, parking accommodation and "all usual offices"—and visitors from afar also find a camping site with sanitation and running water!

The International Week, which began with contests last Sunday and ends with more this coming Sunday, attracted over 70 entrants from France, Belgium, Denmark, Holland, Jugo-Slavia and Italy, though at the time of going to press there was some doubt if the 14 from the last two named countries would be able to make it on account of visa difficulties.

Grapes from Greece

THE Bristol Wayfarer which has recently returned from its 4,000-mile demonstration tour of France, Switzerland, Italy and Greece (see picture on this page) brought back the first consignment of fruit ever to be flown to England from Dr. Joad's spiritual home.

Some 60lb of grapes, fresh from the Grecian vineyards, were sent by the Lord Mayor of Athens to his counterpart in Bristol as a gift for the Bristol hospitals.

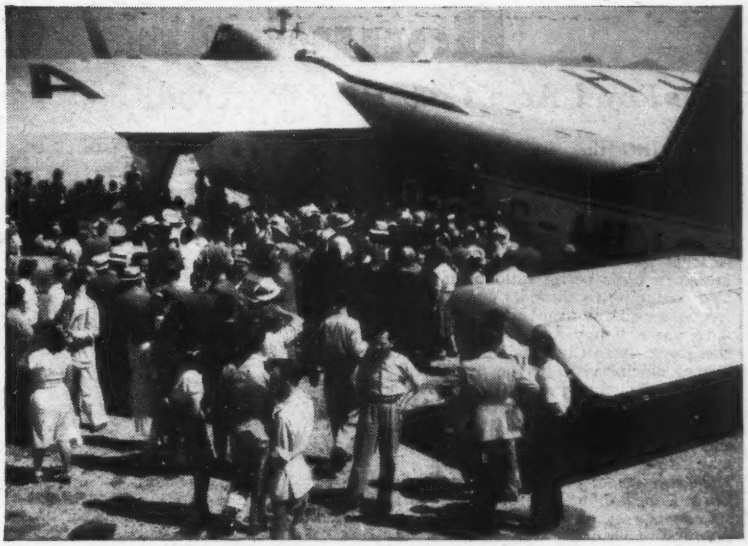
Another little job performed by the Wayfarer, was to fly a young Greek, in need of an immediate operation, from his home in Crete to Athens where he was rushed to hospital and straight into the operating theatre. Capt. K. J. G. Bartlett and the crew of the Wayfarer gave this young Greek his only chance of life, and nothing is lost to international goodwill and the hopes of world peace by such kindly acts—Good show, indeed!

"Combined Op" at Camberley

IT is a distinctly healthy sign that Marshal of the R.A.F. Lord Tedder, Chief of Air Staff, and Admiral Sir John Cunningham, the First Sea Lord, should have been among those invited to address the Army conference at the Staff College, Camberley.

Before the 1939-45 war it is highly improbable that any member of the two sister Services would have been drawn into the Army's official deliberations, but the value of combined operations and the sheer indispensability of close co-operation between all three Services were lessons well and truly learnt in World War II.

It must be admitted, of course, that this single "combined op" at Camberley does not guarantee that the three Services will stick as closely together in peace as they learnt to do in war, but at least it gives good cause to hope that they will.



HERACLION HOLIDAY: The good people of Crete showed great interest in the Bristol Wayfarer when it visited the island (see "Grapes from Greece") during its recent tour of Europe and the Mediterranean.

News in Brief

THE first of the four Viking aircraft on order for the King's Flight was recently delivered to the R.A.F., and the selection of pilots and crew is being considered as we go to press.

* * *

Mr. Geoffrey De Freitas, the Under Secretary of State for Air, will make a tour of overseas Commands of the R.A.F. during September, and will visit units in the Middle East, India and Africa. He will be accompanied by Mr. Michael Cary, his Private Secretary, and by Wing Cdr. P. Burnett, D.S.O., D.F.C.

* * *

The Lancaster, *Aries*, was due to leave the Empire Air Navigation School at Shawbury yesterday in an attempt to lower the England-Australia record and should be well on its way by the time these words appear in print.

* * *

Congratulations and best wishes to F/O. Kenneth G. Mitchell, only son of the late "R. J.," and to Miss Margaret Alison Barrow, who were married at St. George's, Hanover Square, on Saturday, August 10th.

* * *

A memorial tablet commemorating the men of the 1st Battalion, The Border Regiment, Airborne Division, who left Burford Priory, Oxfordshire, for Arnhem on September 17th, 1944, was unveiled last Friday in the private chapel of the Priory by the Vicar of Burford, the Rev. Fairfax Scott-Tucker.

* * *

It is proposed to hold a reunion next month of R.A.F. and W.A.A.F. officers who served with No. 1 Ferry Unit, at Pershore R.A.F. Station. Those interested should communicate with R. W. ("Dickie") Palmer, Air Ministry P.R.3(a), 29, Queen Anne's Gate, London, S.W.1.

* * *

The Argentine Government has placed an order, worth nearly £175,000, with Miles Aircraft, Ltd., for 150 "Maggies" and a complete set of spares for each machine. Some of the aircraft, which have been repurchased from the British Government and are being reconditioned at Reading, are to be allocated to the officially sponsored flying clubs in the Argentine.

* * *

Sir John Lennard-Jones has relinquished his appointment as Director-General of Scientific Research (Defence) in the Ministry of Supply to return to his post at Cambridge University. Sir John has been on loan to the Ministry since 1939, and the University has agreed to make his services available, on a part-time basis, as Chief Scientific Adviser to the Ministry of Supply.

AIRSTRIP . . . No. 28

D

Round the Clubs

The Royal Aero Club Pays Week-end Calls : Seventeen Airfields Visited

DURING the last few weeks the flying clubs have been able to get into something of their pre-war stride again. Long-awaited aircraft have been delivered, certificated and put into service, and the co-operation of the weather has helped everyone. The increase in basic petrol rations for cars is also beginning to show its effect in more frequent visits by members to their clubs.

It was a happy and timely idea that the Royal Aero Club should pay an informal official visit to the flying clubs. Accordingly, flying in a de Havilland Dove, a party led by Air Commodore Whitney Straight, C.B.E., M.C., D.F.C., and Col. R. L. Preston, C.B.E., Chairman and Secretary-General of the R.Ae.C. respectively, and including Lord Donegall, and aeronautical correspondents, set off from Heston on the morning of Saturday, August 10th.

The Dove was piloted by Mr. I. S. Fossett, of the D.H. Company, and Air Commodore Whitney Straight flew as co-pilot.

"Flight" photograph.

(Left to right.) **Disembarking from the Dove at Luton are Air Commodore Whitney Straight, Col. Preston, Mr. Fyfe and Mr. Narracott.**

On the first day, in spite of large areas of bad weather, the following clubs were visited according to schedule: West London Aero Club, White Waltham; Fair Oaks Aero Club; South Coast Flying Club, Shoreham; Hampshire Aeroplane Club, Eastleigh; Wiltshire Flying Club; Weston Aero Club, Weston-super-Mare; Oxford Flying Club, Kidlington; Midland Aero Club, Elmdon; Auster Flying Club, Rearsby.

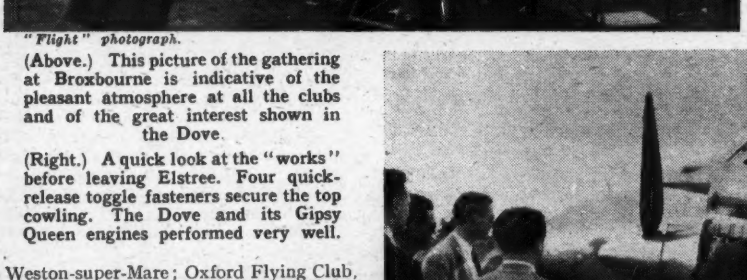
The party spent the night at Ratcliffe Hall, Leicester, as guests of Sir Lindsay Everard, and Air Commodore Whitney Straight was presented with a pair of cygnets for the lake at his home near Heston. They proved good passengers.

Starting early on Sunday, the party received a warm welcome from the Nottingham Flying Club at Tollerton, and went on to visit six other clubs, namely: Yorkshire Aeroplane Club, Sherburn-in-Elmet; Cambridge Aero Club; Luton Flying Club; London Aeroplane Club, Panshanger; Herts and Essex Aero Club, Broxbourne; and United Services Flying Club, Elstree, before returning to Heston in the evening.

At each club a previously completed questionnaire was handed to Miss Bance, of the Royal Aero Club, a member of the party, and in this way a complete up-to-the-minute picture of each club's activity was obtained. Answers to questions included hours flown, numbers of members, types of aircraft, rates, etc.

Everyone remarked on the favourable impression they had gained of the little Dove; it was quiet, smooth and comfortable. A quite remarkable performance to the credit of Mr. Fossett and the Dove was the full-load landing and take-off at Broxbourne, which has a maximum run on grass of 700 yd, with trees or buildings to clear at the boundaries. On this occasion the Dove, after running-up to full power against the brakes, unstuck in little over 300 yd and cleared obstacles on the initial climb with ease.

This enterprising little week-end air tour was voted a great success by all concerned, and calls for a repeat fixture.



"Flight" photograph.

(Above.) This picture of the gathering at Broxbourne is indicative of the pleasant atmosphere at all the clubs and of the great interest shown in the Dove.

"Flight" photograph.

(Right.) A quick look at the "works" before leaving Elstree. Four quick-release toggle fasteners secure the top cowling. The Dove and its Gipsy Queen engines performed very well.

Research

First Details of the New National Aeronautical Establishment: Stress on Supersonic Tunnels

REASONS for the urgent need of up-to-date equipment were given the other day by Sir Ben Lockspeiser, Director-General of Scientific Research (Air) for the Ministry of Supply, when he disclosed details of the large research establishment which is to be built at Thurleigh, near Bedford, and which, as previously announced, will cost approximately £20 million.

Low-speed, low-power wind tunnels had served us well enough until the advent of jet propulsion and very high speeds. Now something much more elaborate was required, and since power-required increases as speed, it was obvious that research equipment must be on a large scale, and therefore expensive. In the past, it had been possible to use fairly small models and test them at comparatively low speeds. Nowadays we had to have tunnels in which full-scale speeds could be attained, and moreover it was necessary to go to speeds even greater than flying speeds in order to discover what happened at those speeds.

Mr. W. G. A. Perring, chief of the Royal Aircraft Establishment at Farnborough, explained the different types of wind tunnel required for different forms of research. Tunnels in which data could be compiled for the design of long-range low-drag aircraft at ordinary speeds; tunnels in which compressibility effects could be studied; tunnels for sonic and supersonic research; and tunnels for testing the spinning characteristics of the new types of aircraft that would be coming along.

The ultimate proof, however, has to be provided by actual full-scale flight, and Sir Ben explained that the intention was ultimately to have a runway five miles long, so that a pilot, when making first flights on a new type, could touch-down again on the runway if the aircraft showed any unpleasant characteristics. This runway would be established between the existing airfield at Thurleigh and that at Little Staughton to the east. Another airfield at Twinwood, south of Thurleigh, would be used mostly for landings, and there would be a taxi track between these two.

Wind tunnels and similar equipment will be located next to the Twinwood airfield, and the rest of the testing equipment will adjoin the Thurleigh ground. The country in this neighbourhood is considered particularly suitable, having no high hills, and being close enough to Bedford to provide labour and amenities.

The proposed layout of the new National Aeronautical Establishment is shown in a perspective diagram. The equipment which it is planned ultimately to have installed includes the following:

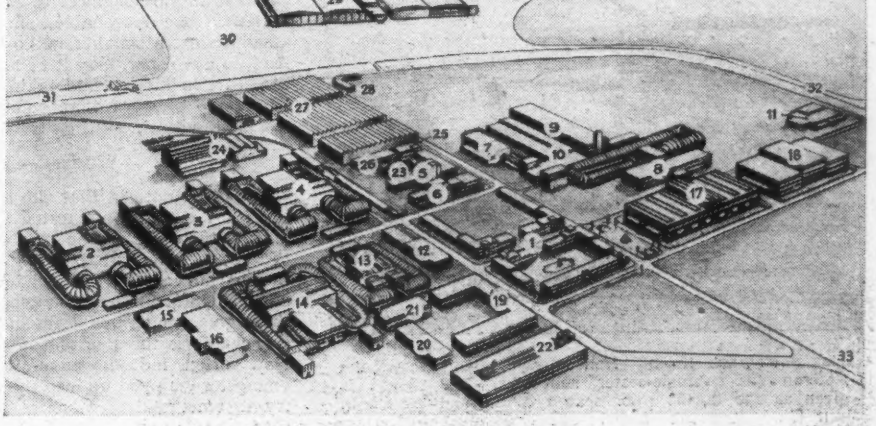
A supersonic wind tunnel, working section 3ft square, using certain powerful German machinery, capable of tests at the equivalent of 1,500 m.p.h. at sea level.

A tunnel for investigating the tendency of aircraft to spin by the use of free models in a vertical air stream. Air compressible to four atmospheres, stream diameter 15ft. Power 1,500 h.p. Grouped with this tunnel will be a high-speed flow laboratory with a number of small supersonic tunnels for investigating tunnel design, and for special researches.

Several wind tunnels to run at moderate speeds and under atmospheric pressure, which will be used in general investigations of aerodynamic problems on aircraft of all types. The first pair of tunnels designed to have a working section 13ft × 9ft with driving motors of 1,500 h.p. each. Four similar tunnels are also planned with working sections 16ft × 12ft and having driving motors of 2,500 h.p.

Supersonic wind tunnel, 8ft × 8ft working section, total power about 45,000 h.p. Wind speed equivalent to 1,500 m.p.h. at sea level. Will probably have provision for removing exhaust gases so that running power plants may be tested either alone or installed in aircraft models.

One large supersonic wind tunnel (or possibly two); total power about 120,000 h.p.; speed equivalent to 1,500 m.p.h. at sea level.



LAYOUT OF THE N.A.E.—1, Central administration and departmental headquarters offices; 2, compressed air tunnel and atmospheric tunnel (16ft x 12ft); 3, atmospheric and high-speed tunnels (16ft x 12ft); 4, atmospheric and high-speed tunnels (16ft x 12 ft); 5, spinning tunnel; 6, high-speed air-flow laboratory; 7, high-speed tunnel (8ft x 8ft); 8, large high-speed altitude tunnel; 9, exhausting and compressing plant; 10, refrigeration and cold-chamber; 11, supersonic tunnel (3ft x 3ft); 12, general purpose laboratory; 13, two 13ft x 9ft atmospheric tunnels; 14, compressed air and atmospheric tunnels (16ft x 12ft); 15, naval aircraft lab. and offices; 16, naval aircraft wind tunnel; 17 and 18, structures laboratories; 19, 20, 21, metallurgy main building, laboratory forge and foundry; 22, chemistry laboratories and offices; 23 and 24, central electric sub-station, heating plant and power station; 25, medical and welfare; 26, workshop organisation offices; 27, main workshops and stores; 28, departmental flight H.Q. and laboratories; 29, flight hangars; 30, paved flight apron; 31 and 32 taxi-track to Thurleigh and Twinwood airfields; 33 main road from Bedford.

In addition to a main airfield, there will be a special long runway, initially 3 miles in length with possible extension at a later date to 5 miles, having an overall width of 600 yards and with a paved strip of adequate width down the centre.

A tunnel to investigate the dangerous vibration of aircraft wings and control surfaces, known as "flutter."

Compressed-air tunnels with 16ft × 12ft working sections, enabling full-scale flight conditions to be more accurately simulated on model tests, without entailing the use of very large-power driving motors.

A tunnel specially designed with very low turbulence airflow, for tests on wing sections.

Structures laboratory, incorporating a very large test frame; 1,000-ton and 300-ton testing machines; drop-test and other apparatus.

Second structures laboratory, mainly for fundamental research.

A spinning tower capable of testing airscrews of a size appropriate to 6,000 h.p. engines.

Metallurgical and chemical laboratories.

It is estimated that ultimately a staff of about 5,000 will be required, of whom some 1,400 will be highly qualified scientists and technicians. Close attention is being given to the amenities—there will be playing fields, hostels and cultural facilities.

LET US HAVE—

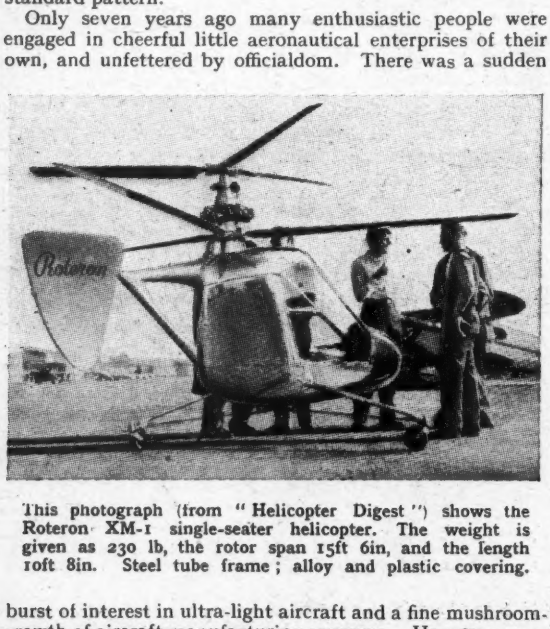
Encouragement for Fools

What of the True-blue Amateur? : Some Serious Suggestions in Light-hearted Manner

By RISTEARD MAC ROIBIN

SOMEBODY or other, while commenting recently on a suggestion that there should be air-taxi services for theatregoers from the country, remarked that "cheerful enterprises of this kind do more good to aviation than all the publicized, pressurized, stratospheric stuff that is so far removed from the little world in which most of us live." How right that is. It seems sometimes as if we are all due to be "publicized and pressurized" to a standard pattern.

Only seven years ago many enthusiastic people were engaged in cheerful little aeronautical enterprises of their own, and unfettered by officialdom. There was a sudden burst of interest in ultra-light aircraft and a fine mushroom-growth of aircraft manufacturing concerns. Hammers were set tapping in many a backyard, while commonsensical folk looked gravely at each other and wagged their heads knowingly. But who cared about that? For myself, I consider that I learnt more when nailing together a "Flying Flea" than during a two-year apprenticeship in a big aircraft factory. Now, with the war over, private flying back (or is it?), and some hope of a return of the Good Old Days, we poor fools are looking forward to getting our fingers into the glue again.



This photograph (from "Helicopter Digest") shows the Roteron XM-1 single-seater helicopter. The weight is given as 230 lb, the rotor span 15ft 6in, and the length 10ft 8in. Steel tube frame; alloy and plastic covering.

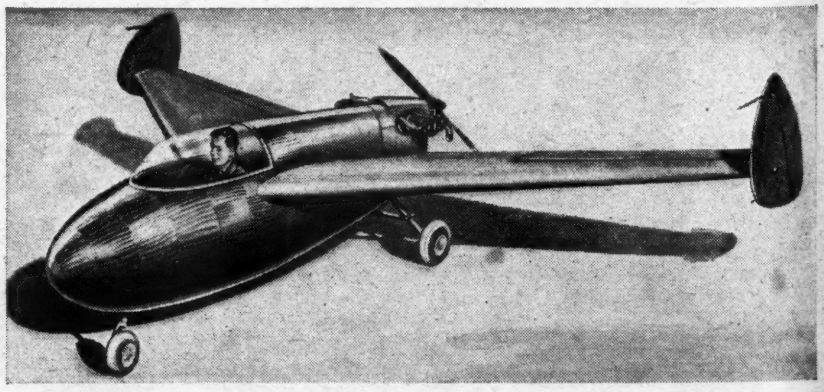
At the moment, unfortunately, the policy of the authorities over this business of sporting flying appears to be somewhat uncertain. Until conditions, generally, become more certain, we might be well advised to wait while the authorities finish their fight to reinstate commercial flying and are given time in which to mellow somewhat before pressing our claims. In the meantime, no harm will be done by discussing the matter and it may help to clear the air in more ways than one.

I suggest that there are various ways by which the necessary control could be exercised over ultra-light, sporting flying without the need for the rigorous regulations of a C. of A., which, together with its cost, are prohibitive and unnecessary for fine weather fun-flying. If the authorities insist on a C. of A. then it means that the amateur cannot build his own machine. The only alternative is a simplified, factory-built job; the cost will then go up and more than half the value of the thing is lost.

However, I do not believe this to be necessary. A thoroughly tested and approved design, and a check by a licensed aircraft engineer to ensure that workmanship and materials are reasonable, should suffice to protect the amateur aircraft-maker without actually eliminating him. And, in a whisper, may it be added that the amateur, with his heart in his job and taking his time, often does a far better job of work than some of our clock-watching so-called tradesmen.

Wanted—a Design

It will be noticed that the real key to the solution outlined is the use of a "tested and approved design," and, indeed, the design is the crucial point of the whole matter. Where shall we find the designer? The necessary qualifications indicate that we should seek him in some design office. Unfortunately, judging by their pre-war efforts, these good gentlemen seem incapable of the stark simplicity which is the *sine qua non* of the ultra-light aircraft. How often, indeed, have we seen some enthusiastic youngster whipped up into the wheels of the aircraft industry to emerge that spineless product of modern civilization—the half-way specialist, who seems to complicate for complication's sake. But surely it is not too much to hope that somewhere there could be found a group of experts with a practical knowledge of aeronautics, who would be prepared to devote a little of their time to the designing, building and testing of a machine, and who would supply the rest of us with sets of drawings at not more than a couple of pounds a time. And may I recommend anyone who might consider taking on the job, to read and re-read (if he has not already done so) a book by the man who made amateur aviation a reality. I refer of course, to



An artist's impression of a single-seater tailless pusher. It is of all-wood construction with ply covered fuselage, and 25/35 h.p. flat twin.

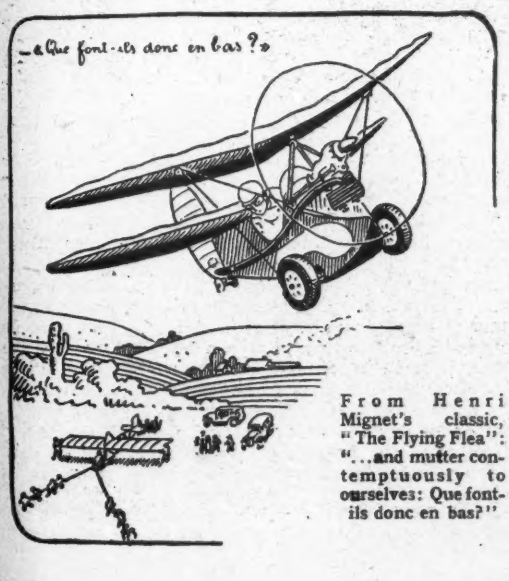
ENCOURAGEMENT FOR FOOLS

Henri Mignet's *The Flying Flea*, published by Samson Low. It will educate him (no matter how learned he may be), encourage him and sustain him in his labour.

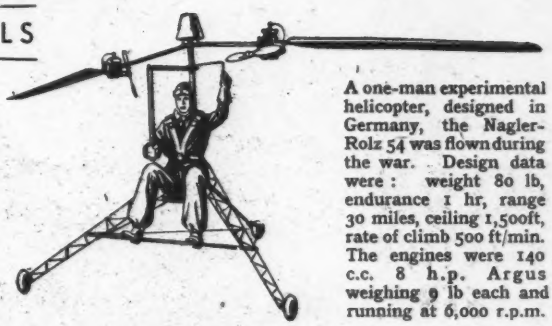
There were those who thought that the unconventionality of the "Flea" was its weakness, and so attempted to remedy the situation by producing ultra-light aircraft of similar size but of conventional design. It seems fairly obvious that unconventionality must be the order of the day, if only to eliminate for the home handyman the complications of the orthodox control system, to reduce, for the factory producer, the man-hours which form such a high proportion of his outlay, and to cut the weight, for everybody, to a minimum.

Next only in importance to our little aircraft's ability to stay in the air and to suffer rough handling without disintegration, is the question of cost. It is the criterion by which each detail of the design must be judged. For the amateur who, as the very word suggests, works for the love of working, the price of labour is negligible, provided that it is within his own ability and he does not have to call on a professional tradesman for help. The commercial manufacturers, however, have to weigh their labour costs very carefully, so it would appear that at least two different designs will be needed. I believe that there will be room for both types. There will always be those, who, no matter how keen, will not be in a position to build their own machine. If I may push my personal foolishness so far, I would suggest as possibilities: (1) for the amateur constructor a shoulder-wing tailless pusher in wood, with the cockpit between the spars; and (2) for the professional manufacturer a welded tubular steel Autogiro with an option on jump starting.

My idea of an ultra-light aircraft is not of a machine for going places but of one which, carefully handled with suitable advantages, will provide educative amusement and enable one to get one's feet off the ground. I repeat the design must be by the expert. In order to bring it within the scope of the more ordinary salary the engine must be small and we must compensate for this with low structural weight. For this reason, and not from aerodynamic considerations, I suggest that the ultra-light aircraft could do without tail surfaces and a stressed fuselage. There would also be attendant advantages from the constructional viewpoint. With the design in the hands of experts I see no reason why the tailless layout should be more unsuitable for the ultra-light than any other class and, in fact, the necessarily limited speed range would go some way towards eliminating the principal problems.



From Henri Mignet's classic, "The Flying Flea": "...and mutter contemptuously to ourselves: Que font-ils donc en bas?"



A one-man experimental helicopter, designed in Germany, the Nagler-Rolz 54 was flown during the war. Design data were: weight 80 lb, endurance 1 hr, range 30 miles, ceiling 1,500ft, rate of climb 500 ft/min. The engines were 140 c.c. 8 h.p. Argus weighing 9 lb each and running at 6,000 r.p.m.

A lot is said these days about helicopters, and it seems that in many ways these are becoming more and more complicated. Development of the larger types, however, must eventually result in a simplified, if restricted, control that might suit ultra-light purposes. My leanings at the moment, however, are towards an Autogiro type somewhat similar to the towed glider used on U-boats.

Strictly Utilitarian

However, no matter how the actual designs may vary, there are many features which must be regarded as essentials, and we must always resolutely turn our backs on the tuppence-coloured and stick to the penny-plain. Dealing with the question of the size of our machine, Mignet's style is as eloquent as it is typical. "Everyone" he says, "dreams of taking out their little girl friend before they know whether they can raise themselves from the daisies! Aviation is a solitary sport . . . A two-seater will necessitate 35-40 h.p., a double load of petrol, considerable expense—it is the other type of aviation." That is it in a nutshell. We poor amateurs, spending money we find so hard to earn, cannot afford the considerable expense of that "other type" of aviation. Our machine must be a single-seater, with an engine of about 25 h.p., and costing less than £50. Pre-war possibilities in this class were the Aero Engines' "Sprite" and the two-stroke Scott. Both gave about 25 h.p. for take-off and weighed about 80lb.

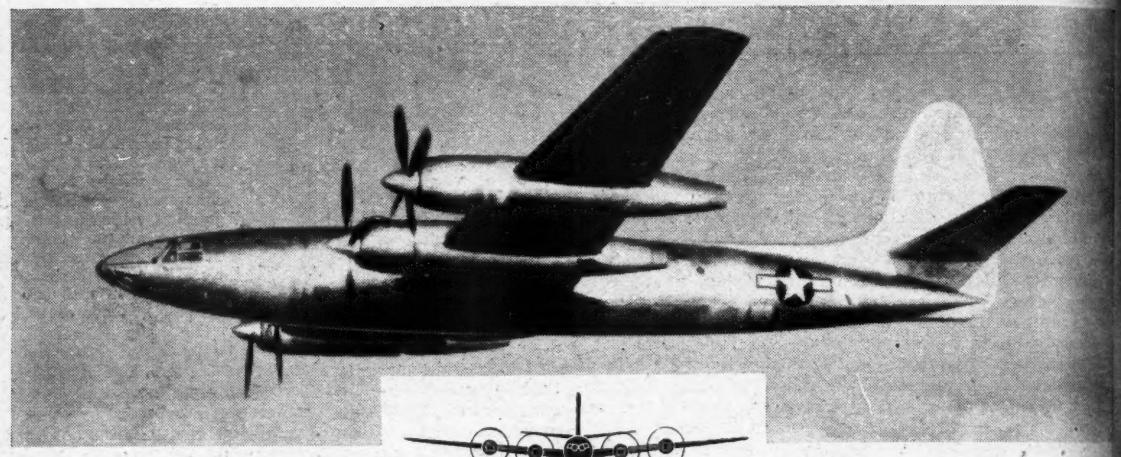
There are other risks of increasing the cost which we must avoid. Cowlings, fairings and every little luxury must be eliminated from the naked reality of our aircraft. Expensive habits are acquired by working on expensive aircraft. Non-structural parts do not require high-quality materials; let us get out that old tea-chest and put it to use. Aircraft linen is not really necessary for use when boxing-in the sides of a fuselage. The cost and weight of aircraft-type wheels and tyres are both too high, so why not use the wheels which are used on the front of carrier cycles, with levered rubber suspension, and keep the fuselage close to the ground? Could not hard-wood bearings be used for control-rods and the like? It is better to fly with heavy controls than not fly at all, and our machine does not need a long commercial life.

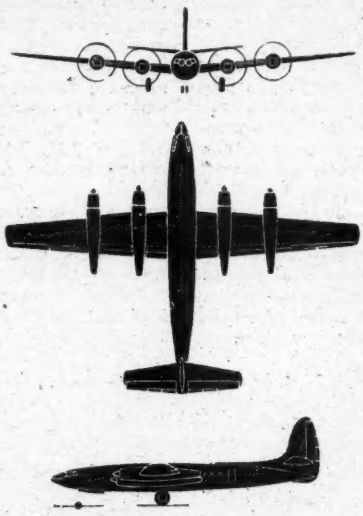
Would it not be possible . . . ? Yes! surely it would, and then we could follow Mignet into the skies, and, as in his delightful drawing, we could peer over the edge of our own cockpit at our fellow-men below, straining on elastic ropes, and mutter contemptuously to ourselves: "Que font-ils donc en bas?"

THE FOLKESTONE TROPHY

AT least thirty aircraft, seventeen of which are Continental entries, are expected to compete in the Folkestone Air Race. The heats will be flown on Saturday, August 31st, and the final on the following day.

On the Sunday there is also to be a high-speed handicap race over the same course, which starts and finishes at Lympne Airport, with turns at Capel, between Folkestone and Dover, and Folkestone Harbour. This is the first air race in which jet aircraft have competed, and it is understood that Mr. Geoffrey de Havilland will be flying a Vampire, and other entries include a Gloster Meteor, a Fairey Firefly and a Supermarine Spiteful flown by Mr. Jeffrey Quill.





Republic Rainbow

A Transport of Exceptional Performance: Impressions of the Military Prototype

IT is evident from what little information has been released on the Rainbow high-speed transport now being developed in America by the Republic Aircraft Corporation that this machine will set a new performance standard for large aircraft powered by piston engines. A member of the Editorial Staff of *Flight*, who lately visited America, was privileged to make a brief inspection of the military prototype of the Rainbow and his impressions are given below, together with some notes on the new transport. The military machine, designated XF-12, was designed solely for long-range, high-altitude, high-speed reconnaissance, particularly in the Pacific theatre, and is claimed to have a range of 4,500 miles. Of this machine *Flight's* representative writes:—

One of the reasons why the Rainbow gives the impression of being "medium-sized" is its excellent proportions and beauty of line. When inside the pressurized fuselage of the military prototype, in spite of the large amount of experimental, photographic and recording equipment, it is easy to visualize a reasonably spacious passenger cabin. The first airline Rainbows are due about the end of 1947 and orders include twenty for American airlines and six, plus probably twelve more, for Pan American.

The Republic type of "ring" fuselage construction lends itself particularly well to a pressurized structure, and although the Rainbow is a mid-wing aircraft there are no through-spars, all loads being transferred to the fuselage centre-section frames.

The four Wasp Majors on the military version were examined on the second example, which was in an advanced stage of construction in the assembly shop. The layout of each power plant and its two exhaust-driven turbines with jet outlets from each, is extremely intricate and compact. The civil version will have only one turbine and jet per power unit and is expected to be about 20 m.p.h. slower. The power available from each of the double-jets on the military version is about 200 lb thrust under maximum power conditions for the Wasp Majors.

A notable feature of the Rainbow is the admirable layout of the pilot's cockpit and the vision from it. In view of the spinner-shaped nose and internal "windscreen" many will have questioned the view from the pilot's seat. This view is, in fact, excellent. Each pilot is faced by his wheel and a group of essential instruments. In the middle is a neat pedestal carrying controls for engines and ancillaries. The front of the cockpit is divided from the conical non-pressurized nose by glass screens $1\frac{1}{8}$in thick, and the top half of the nose itself is transparent. It is intended that on later models the transparent "quarter-cone" nose panels, which are merely fairings, shall fold round and down for take-off and landing, leaving, in effect, a large conventional windscreen and the lower half of the nose. Any risk of steaming or icing-up can then be dealt with in the usual way.

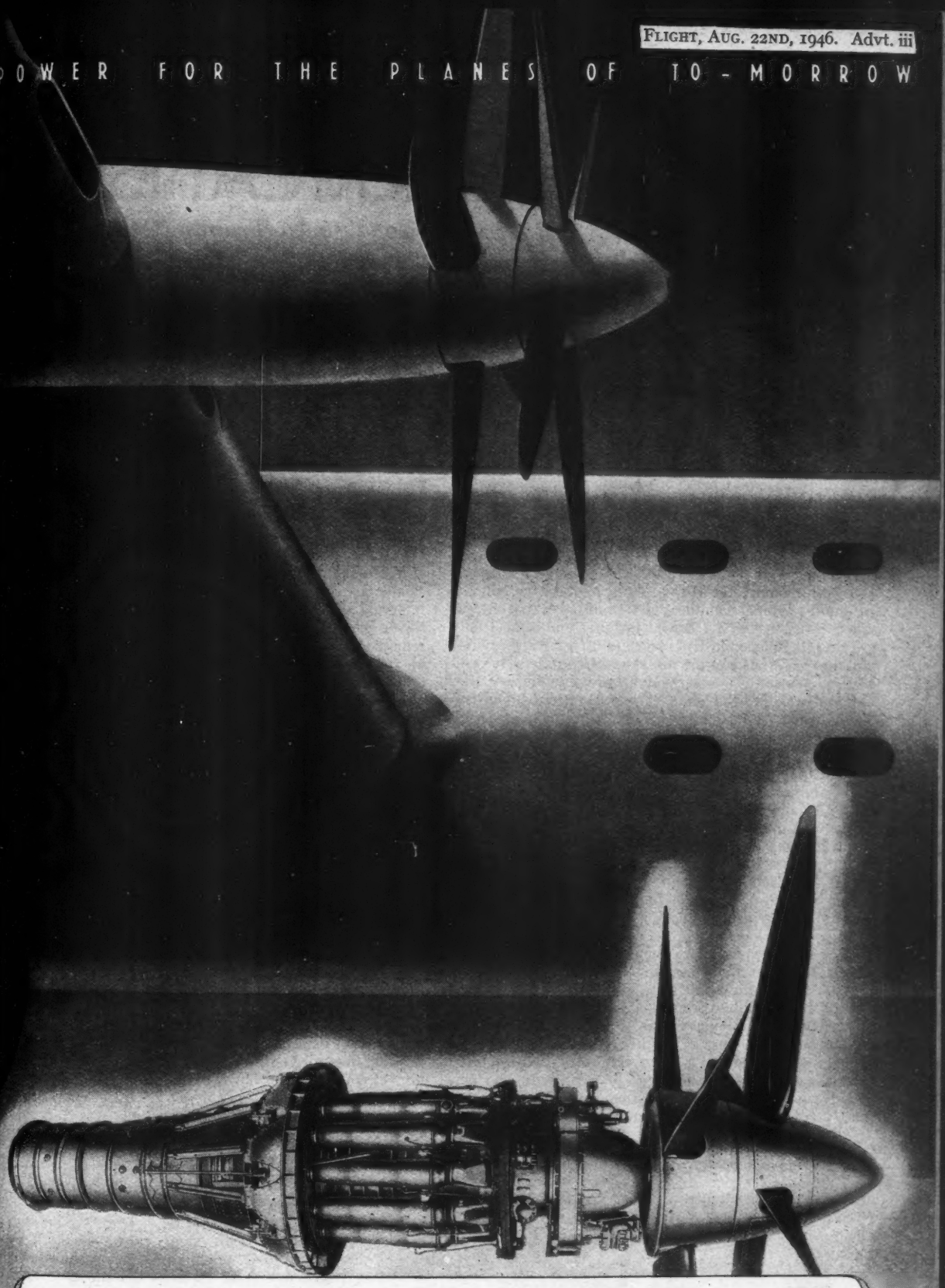
The Rainbow, or RC-2, is fitted with four Pratt and Whitney Wasp Major R-4360 28-cylinder radials rated at 3,000 h.p each and driving 4-blade airscrews over 16ft in diameter. Utilizing the full power (equivalent to 3,250-3,500 h.p., including thrust from the turbo-blower exhaust) the Rainbow will have a maximum speed of 450 m.p.h. at 40,000ft and will cruise at 400 m.p.h. or more at the same level. The rate of climb at sea level is claimed as 1,680 ft/min at a gross weight of 114,200 lb; the pay load for a range of 4,100 miles will be 10,000 lb, including forty passengers, 1,600 lb of baggage and 1,700 lb of cargo.

The Republic designers foresee that the Rainbow will make regular flights from New York to London in about 9 hours. Pressurizing and air conditioning will be standard and although the fuselage of the Rainbow will be comparatively small by comparison with other transports of similar power the seating will permit "full relaxation." Complete dining facilities, a lounge and a bar will be provided. A "plane-to-shore" telephone is also foreseen.

REPUBLIC RAINBOW (RC-2)
FOUR PRATT AND WHITNEY R-4360 ENGINES

Span	129ft 2in
Length	98ft 9in
Height	29ft 11in
Max. fuselage diameter	10ft 3in
Wing area	1,640 sq/ft
Empty weight	66,980 lb
Gross weight	114,200 lb
Cruising speed	Over 400 m.p.h. at 40,000ft
Maximum speed	450 m.p.h. at 40,000ft
Rate of climb on 2 engines	320ft/min (at 5,000ft)
Service ceiling	41,000ft
Take-off run over 50ft screen	4,300ft
Stalling speed	95 m.p.h.

POWER FOR THE PLANES OF TO-MORROW



ARMSTRONG SIDDELEY

PYTHON

One of the most powerful aero engines in the world

IN THE AIR (XVIII)

THREE AMERICANS

Harvard, Helldiver and Bermuda : Conditioned Training Memories : The G-Stall is "Invented"

By "INDICATOR

THE only pilot who is likely to be capable of writing objectively rather than subjectively about the North American Harvard is the instructor. And even he probably became much too accustomed to the type in the course of a few thousand hours of back-seat driving to be able to retain clear and critical impressions.

To the vast majority of pilots the memory of the type has been firmly conditioned by the fact that it was, for them, the first full-size and complicated aircraft of which they had had experience. Except by the instructors, the ferry pilots and a few maintenance unit test pilots, the Harvard was rarely flown by anyone after the sometimes brief period of concentrated training.

Lasting Impressions

In my memory the Harvard still remains the epitome of mind-warping complication—simply because it was the type on which I received my first and almost only period of advanced instruction, and it certainly provided my first experience of the need for cockpit memory drill. With its typically American odour, and the complicatedly rational way in which the various controls and instruments, then so strange, were laid out, my memory of the Harvard is completely subjective. To add to the difficulty, after three or four dual circuits to ensure that I was capable of remembering constant-speed airscrews, flaps and retractable undercarriages, which were then such new and unknown quantities, we then went straight up to 8,000 ft to do some spinning. Now to spin a Tiger Moth or even a Tutor was one thing, but the Harvard in its spin was quite another. Not only did it enter with the most violent movement, but it hardly appeared to rotate with any degree of regularity, and it recovered somewhat sluggishly unless a "new" technique was used. The principle was that of applying full opposite rudder *before* easing the column forward, in order that the rudder should not be blanketed by the elevators.

After this preliminary spin, from which I recovered in a distinctly feather-brained state, we proceeded, at the instructor's suggestion, to start a loop. As he had not told me about the aircraft's quite miraculous capacity for G-stalling, I executed a very tidy flick half-roll soon after the aircraft had reached an inverted position. This exercise was designed solely to demonstrate the fact that the Harvard, controllable though it was, could not be treated entirely with disrespect. The airspeed over the top was possibly 100 m.p.h., and because I wished, in the time-honoured way, to keep my weight nicely in the seat, I instinctively tightened the loop as the speed dropped, so that an immediate and violent flick was the result. During later landings I also learned that aircraft with comparatively high wing loadings, and showing a considerable difference in angle between the approach and landing attitudes, made contact with the ground rather more docilely if a suitable amount of urge was applied during the process. This, in order to prevent both any loss of speed and a tendency to stall prematurely through too-rapid checking. These lessons, though now ancient history, were new in 1939.

Later experience with the Harvard II was obtained at irregular intervals, and it was curious how very much smaller and less lethal this aircraft appeared after long intervals of flying in more genuine military aircraft. Nevertheless, the strongly imprinted early impressions remained—unless and until one was actually seated in the machine. Merely to be told that there was a Harvard to fly still, after many years, produced an automatic conditioned memory of difficulty and of obscure characteristics which had to be combated. The Harvard is still used as an advanced trainer, and this aircraft, probably more than any other, laid the basis of modern aerodynamic understanding in the minds, eyes, feet and wrists of a very large proportion of Service pilots.

A Queer Contraption

With a mere couple of hours or so in my logbook following the words "Curtiss SBC-4," I am certainly not in a position to write even with faint knowledgeability about this type—the forerunner of which was known, melodramatically enough, as the Helldiver. The fact that such a type-name could be seriously applied to any aircraft might, if I permitted it, form the subject of a pleasant dissertation on the American way of life and thought. We English called the SBC-4 the Cleveland, but I doubt if more than half a dozen ever appeared in this country. Long before the early war years the type had really become obsolescent, and one of them—possibly the only one—was later used as a communication aircraft by, I believe, a Fighter Group H.Q.

This Cleveland was certainly a very queer contraption when judged by modern standards. It was a typical Curtiss biplane, with, amazingly enough, not only a retractable undercarriage, but a retractable tailwheel. One sat immediately below and behind the centre-section within a complicated canopy, with all forward view blotted out by the large-diameter Cyclone cowling. The take-off was completed, at least along runways, more by luck than good judgment. During the undercarriage retracting business the movements of the main legs on their way up into the retracted position in the fuselage, immediately behind the engine, had to be seen to be believed. The

The SBC-4 is a typical Curtiss biplane and a development of the melodramatically named Helldiver. The R.A.F. version, known as the Cleveland, had all wheels retractable.

effect, as the wheels finally flopped into their recesses in full view of the crew, could only be described as Disneyesque.

Intended, no doubt, to provide rigidly stable diving characteristics, the controls were, in general, far from light by ordinary standards. I never attempted to use the double-split dive brakes on the lower wing.

No doubt it was, from many points of view, an excellent thing that wartime manufacturers should sometimes have been given an order merely to keep the works and the workers in action during a lull. That, I believe, was at least partly the reason for the order given by the Purchasing Commission for quite a large number of Brewster Bermudas.

Although one or two of these torpedo bombers were from time to time "prepared for issue" by M.U.s, I do not believe one of the type was ever used either operationally or otherwise. Part of the trouble was caused by the fact that the entire series were waiting for some wing modification to be carried out, and, in the meantime, the maximum speed was limited to something like 230 m.p.h. Be this as it may, numbers of these peculiar aircraft littered the Shropshire and other fields while the power units and other items slowly rotted away.

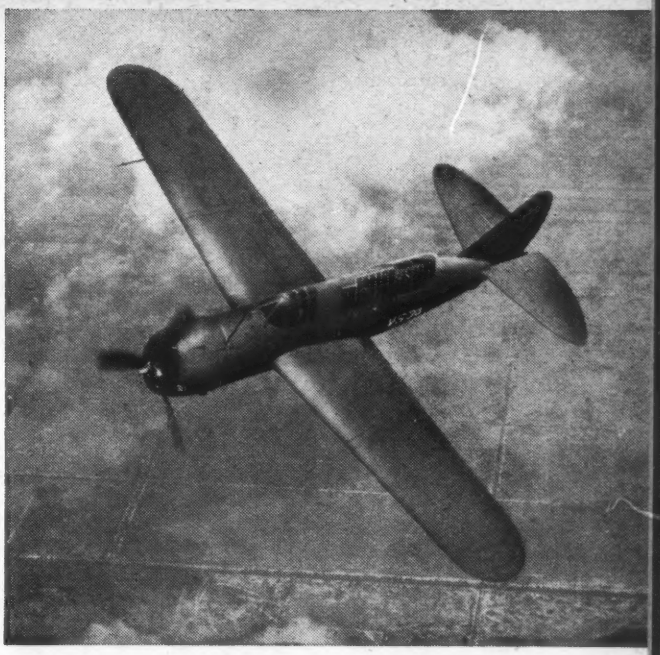
The Bermuda was, in the air, quite an easy and pleasant machine with no particular characteristics, either good or bad. The cockpit was extremely wide, and the pilot felt rather as if he were chairborne in some strangely complicated office. As was so often the case with American aircraft, the fuel system was by way of being complicated, but one soon learned to stick to certain tank combinations and to change them over in good time.

Between Scylla and Charybdis

Immediately before take-off, however, a very important decision had to be made. The undercarriage selector lever was placed almost out of reach below and on the left. In order to operate it one needed to release the Sutton harness. Consequently, one had the choice of taking off with the harness safely locked in preparation for possible engine failure, but with the undercarriage remaining down until the opportunity was found to reach the control, or one could improve the general post-take-off engine failure position by retracting the undercarriage immediately while, however, leaving oneself unprotected in a loose harness. In either case, an engine failure would have been distinctly uncomfortable.

The emergency lowering system was nothing if not Heath Robinson in conception, with two lengths of wire to be pulled for lowering, and two further handles to be pulled if the undercarriage was then to be locked down. Luckily, in this so-roomy cockpit, all things were possible.

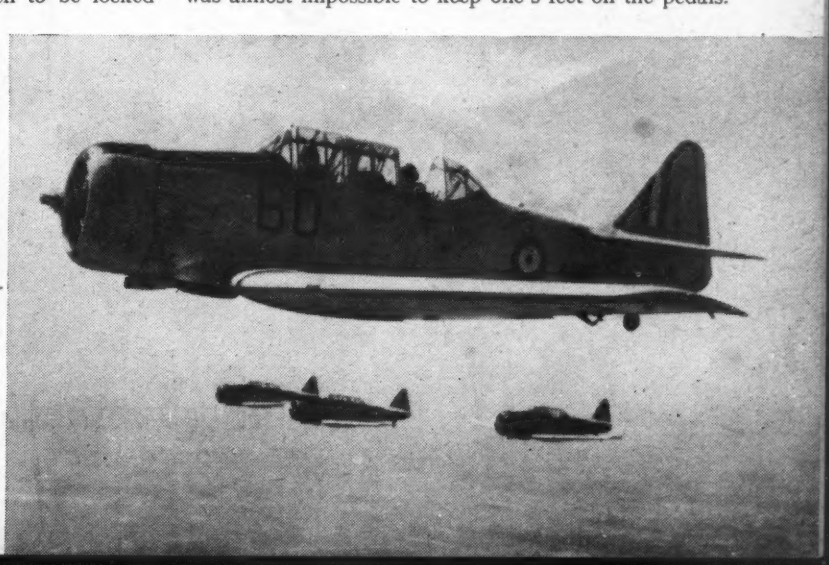
At about the period when my particular M.U. had taken delivery of its first Bermudas, our Group had instituted a phenomenal *blitz* in the matter of ground accidents. We were told that there would be no taxying accidents, and that in all cases the pilot would be blamed. Since, while earthbound in the Bermuda, it was just not possible to see ahead of one at all, we thought that the latest injunctions had appeared at a somewhat inopportune moment. With its somewhat fierce brakes, its wide track and enormous nose, the Bermuda could be weaved safely along a narrow perimeter track only with the exercise of the greatest concentration. Once safely at the end of the runway and with the take-off started, further nervous exhaustion was caused by the extraordinary exhaust note. Because of the layout of the stacks, the engine sounded *most* erratic in running, and this unusual noise caused fire crews to leap to their stations on earlier take-offs.



In the Brewster Bermuda the wide cockpit gave the pilot an impression of being "chair-borne" in some strangely complicated office.

Pins and Needles

This seems to be as good a moment as any to describe, by way of postscript, one of the more peculiar undercarriage-up warning devices which have, from time to time, been invented. In 1941 a unit to which I was attached held a certain number of Northrop trainer day-bombers of an unknown mark. Presumably they were the landplane versions of the N-J seaplanes delivered at about that time to the Norwegians. In this aircraft the effect of closing the throttle with the undercarriage still up was that of producing the most unpleasant pins-and-needles vibration in the rudder pedals. In some cases the vibration was so gentle that it hardly provided a useful warning, but in others it was so intense that it was almost impossible to keep one's feet on the pedals.



Probably more than any other aircraft, the Harvard laid the basis of modern aerodynamic understanding in the minds, eyes, feet and wrists of a very large proportion of Service pilots. Harvard IIs are illustrated.

THE STEEL AUSTER AEROPLANE

"THE EYES OF THE ARMY"

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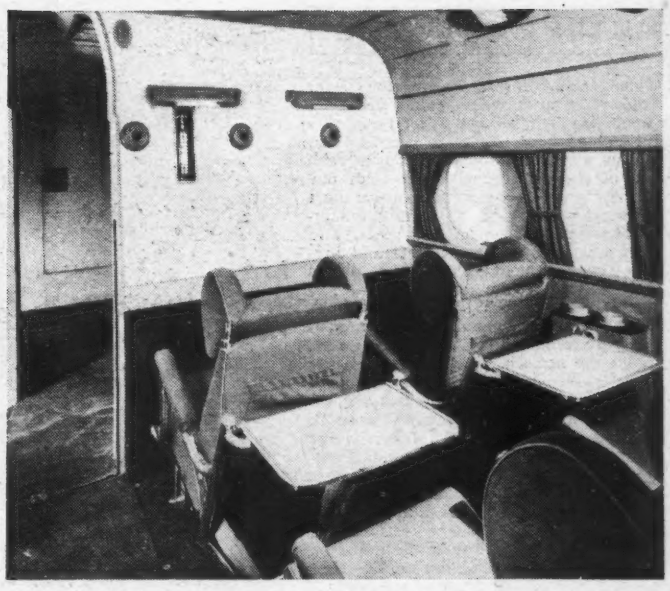
Built-in Cabin Comfort

Planning the Interior of an Airliner : Essential Design Features That Will Appeal to the Passenger

By N. D. RYDER



THE SPACIOUS SANDRINGHAM.—The cabin designer has fewer troubles in providing generous "elbow room" in a flying boat than in land-based aircraft of comparable size. Observe the handy folding tables, adjustable head-rests and generous seat spacing.

ALTHOUGH speed is the chief commodity which the airline operator offers to his customers, he must see that he does not supply it as an alternative to comfort; to-day the air traveller expects both.

Comfort, of course, is one of those relative words, and its precise interpretation depends (broadly) on the age and the bank-balance of the individual. It must thus be borne in mind that accommodation which would amply satisfy the Spartan standards of, say, a young Scoutmaster travelling to an international jamboree with two blankets and a ground-sheet, might provoke adverse comment from a middle-aged, well-to-do company director hastening to the other side of the Empire on one of his business-cum-pleasure trips.

It is a sad fact, moreover, that air travel is a comparatively expensive method of transport and is likely to remain so for some time. And since wealth and waist-line generally gain ample proportions only with advancing years, the bulk of potential airline passengers will not be hardy youngsters; they will be physically and financially "comfortable" people of middle age or more. Theirs is the standard of comfort which the operator must provide.

The fact that the aircraft industry has not yet reached any marked degree of standardization in the design of airliners is an advantage to those concerned with the planning of cabin interiors in that it leaves them a comparatively free hand; within reasonable limits they are not handicapped by having to conform to fixed dimensions and shapes (crippling restrictions when one tries to refurnish a bomber as a passenger-carrying vehicle). Airline operators, however, have acquired quite a lot of information about what is wanted and what should be avoided in laying out passenger accommodation, and so it is possible to set forth a few elementary rules on the subject with the laudable object of giving the best possible service to the air-travelling public.* No attempt can be made here to particularize for specific types of operation—to differentiate in detail as between short- and long-distance requirements, different types of route, and varying frequencies of service—though these factors must, of course, be studied in assessing the final cabin details in each individual case. For the present we have room only to deal with general principles.

OFFSET AISLE.—In airliners of medium size such as the Viking, the "two-and-one" seating arrangement permits adequate space for each passenger without restricting the width of the aisle. The large square windows and indirect roof lighting are good features.

As with the handling of freight, experience has shown that aircraft still spend far too much time on the ground, especially the smaller types of airliner flying over the shorter routes. Indeed, one knowledgeable operator has calculated that in this class of work it is worth sacrificing 80lb of payload to save five minutes on the ground; economically they cancel each other, and the operator reaps a credit balance in the form of better satisfied customers. So far, airport delay has been the most frequent source of passenger complaints.

Rapid entrance and exit to and from the cabin is one of the most vital points in design if time on the ground is to be saved, and yet it is one which has not received very much attention in the past. There are several things

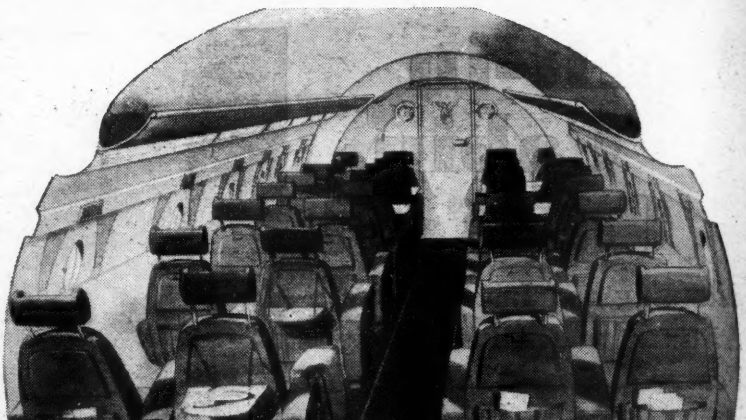
* The subject is receiving considerable attention in the U.S., and a paper on "The Planning of Cabin Interiors for Transport Aircraft" was recently read before the S.A.E. by Mr. Walther Prokosh, of Eastern Airlines' engineering department.

BUILT-IN CABIN COMFORT

which make for a freer and faster "flow" of passengers—cabin doorways should be high enough to let them pass through without having to bend double, two normal width doorways, one at each end of the cabin, are better than one very wide one in the middle, aisles must be of adequate width to permit unhampered passage between the seats, and such amenities as coat closets and luggage compartments should be placed conveniently to the entrances, not forgetting that hand baggage must be dumped before overcoats can conveniently be removed. Three other points under the same heading are the placing of all passenger entrances on the same side of the aircraft, having separate doors for cargo and galley servicing clear of all passenger entrances, and finally, having the cabin floor as near the ground as possible and so minimizing the number of steps passengers must climb and descend.

Before leaving this question of saving time on the ground, it is worth mentioning that it even has a bearing on airport terminal design. The longer the time spent over each aircraft's "turn round" the more airport equipment will there be required to handle a given number of aircraft in a given period of time. And while increasing amounts of money and mental effort are being spent in making aircraft fly ever faster, more and more time is being wasted on the ground in dealing with passengers, freight, mail, and in replenishing the galley. Thus there is an increasing danger of the investment in airport buildings and equipment becoming fatally disproportionate to the investment in flying equipment.

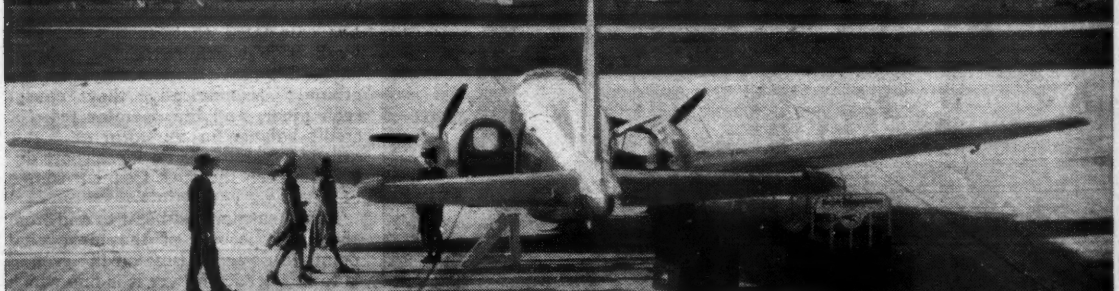
Bearing in mind that but for the presence of the passenger there would be no airline to operate, it is reasonable to give a high priority, when planning an airliner's cabin, to the seat which this passenger will have to occupy. In the past the operator has had to do the best he could within the dimensions of the fuselage presented to him, and arrange a given number of seats according to the anticipated load factor. This meant, in effect, that the comfort of the passenger came a rather poor second to other considerations. Future airline passengers will expect a degree of comfort certainly not less than they formerly enjoyed on first class rail and sea travel, so the cabin planner will have to begin with the seat. In this he has the benefit of some investigations already carried out by Professor E. A. Hooton, of Harvard University, and some recommended dimensions based on the professor's findings are listed at the top of p. 195. They will be open to criticism, of course, but at least they provide a useful start towards setting up a new standard in aerial comfort.



ARTIST'S IMPRESSION.—This sketch of the cabin layout in the Handley Page Hermes shows that double seats on each side of a wide aisle are possible on the larger aircraft. Observe the wide centre armrests, folding trays, and handy pockets for books, etc.

The actual arrangement of seats will be dependent upon such factors as the type of service offered, and the number of seats required in the cabin, but generally speaking, two rows of double seats with a centre aisle has been found to be the best. The width of the aisle has already been mentioned in relation to ease of passenger movement, but it is equally important in permitting adequate room for the serving of meals and refreshments. A too narrow aisle not only slows down the rate at which stewards (and stewardesses) can attend to passengers' wants, but increases the chances of exasperating mishaps—if a bulky passenger in a seat next to the aisle should knock a tray out of the hands of a passing steward and receive its contents down his neck he will no doubt rave at the steward, but the primary fault will probably lie with the cabin designer for not making the aisle a few inches wider. Incidentally, it should not be difficult to evolve a tray rest which folds into the arms of the seat but is perfectly rigid when in use.

Racks for personal belongings should be continuous along the cabin walls but should not be too deep, or small articles, like gloves, may be overlooked and left behind. The racks should be partitioned vertically to match the seat spacing so that everything does not slide in a heap to the rear during take-off, and the underside should be padded—nothing annoys a passenger more than to catch his head a crack on a hard rack



MINIMUM DELAY.—This picture of a D.H. Dove taking on passengers at Northolt illustrates the time-saving advantage of having access to the baggage compartment on the opposite side to the entrance, so that both can be used simultaneously. Avoidance of delay on the ground is particularly important for small, short-range aircraft.

whose immediate proximity he had temporarily forgotten. Finally, the hand rail on the outer edge of the rack should be within comfortable reach of a normal-sized woman—however pretty she may be, even your Tired Business Man does not like to be grabbed accidentally by the ear.

A whole article could be written about the galley and its layout, and much will depend on whether it is only required to serve one meal during a comparatively short flight, or a series of meals on a transatlantic journey with "elevenses" and other light refreshments at intervals between. But there are one or two fundamental points relevant to all cases. First, the galley should be located as far as possible from the toilets to prevent any chance of contamination of food or the food serving area; this is particularly important where these two departments are being serviced at the airport. Moreover, the galley should be immediately accessible to a loading door other than a passenger door. The DC-3 is at fault in this respect; food servicing has to be done through the same single door as passenger embarkation, and this must be avoided in any serious attempt to cut down ground time. Even using its own separate door, it takes about 20 minutes to unload used equipment and take on fresh food and other galley supplies on a DC-4. If this time had to be added to the time required to deal with on and off passengers, the wastage becomes a really serious matter.

Meals and Materials

Galley arrangements, as has been pointed out, will vary considerably on different types of service, but they must always be considered in conjunction with the rest of the cabin and not crammed into whatever space is left over. There must be enough floor space and elbow room to allow the attendant to do his job without having to be first trained as a juggler. On aircraft carrying 40 or more passengers there must be somewhere to stack used trays as well as to prepare fresh ones because the first people to be served will have finished their meals well before the last few have received theirs; where two or more stewards are employed, some sort of "dutch door" will be advisable to ensure maximum efficiency. The practice of preparing much of the food on the ground will have to be developed, because the increasing speed and size of airliners means more meals in less time.

Toilet arrangements on aircraft also begin to assume the proportions of a major problem with the increasing size of airliners, and their servicing is an aspect that calls for particular attention. In any cabin plan with more than one toilet they should be grouped either fore or aft. The design and materials of fittings should be chosen for easy cleaning; there should be one water storage tank that can be filled from outside the aircraft, and the plumbing should have as few bends as possible and the shortest possible run of water from tank to wash-bowls to facilitate frequent sterilization. Hot and cold water, with soap in tissue form, should be provided.

Lighting and electrical equipment, heating, and air conditioning generally, though they have their direct bearing on the comfort of the passenger, are not considered to come within the scope of this article; in any case, some of these subjects have in varying degree been dealt with in earlier features. But a word may be said on furnishing materials.

Even when all long-distance transcontinental and transocean airliners fly in the flat calm "above the weather" there will still be the shorter range trips on which this would not be economical, and thus it seems that a certain amount of air-sickness will always be inevitable. When meals are served *en route* there is also the inevitability of occasional mishaps resulting in the spilling of foodstuffs and various liquids. This means that materials must be chosen which are easily washable and to which odours do not cling. Not unexpectedly it has been found that closely woven fabrics with no nap are better than the chenille type of material—the velvety cord style of upholstery may look very smart, but it should be avoided in the interests of cleanliness. Similarly a vinyl-coated fabric is easier to wash and has less tendency to pick up smells than has leather and, when used for panelling, the panels should be detachable. Wool carpeting is very widely used at present in the cabins of airliners because it looks comfortable, absorbs vibration, and is reasonably light in weight. But it seems probable that before very long it will give place to synthetic carpeting materials, of no greater weight, which are just as good at damping out vibration and equally attractive-looking, but which offer greater resistance to abrasion and are far easier to keep clean. In fact, experiments are being made at present in this field, and those responsible hope to produce a synthetic carpeting fabric with "all the luxury of a wool carpet plus the cleanability of a tile floor."

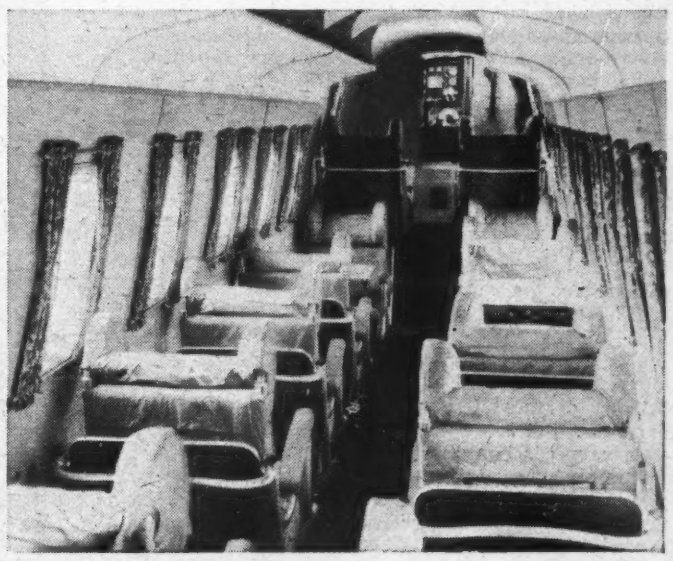
Some Recommended Dimensions

Seat—width between arms	21½ to 21½in
height from floor	16½ to 17in
depth of seat	20in
height of arms above seat	8½in
height of back	28in
width of arm rest	2½in side, 4in centre
adjustable angle of seat back	14 to 39 degrees
Seat spacing (legroom)	39 to 41in
Aisle width	22in minimum
Exits (up to 30 passengers)	30in × 72in minimum

A lightweight, washable material should also be used for the walls of the cabin and the underside of the overhead racks, but in this case an added characteristic is required—it should present a non-reflecting surface. As for the ceiling of the cabin, the same degree of washability is hardly necessary, but the maintenance aspect cannot be entirely ignored, and although the cloth finishes (the cloth generally having a slight nap) being tried out on a number of the latest American airliners look quite pleasant, there would seem to be a lot to be said for some of the new materials now being developed for this part of the cabin. These are laminates having a base of glass cloth and a facing of paper in various shades. Not only are these new materials said to possess the virtues of light weight and good sound-insulating characteristics, but to be washable and very decorative.

Whilst on the subject of furnishing and upholstering materials, there is one vitally important aspect that must never for a moment be overlooked, and that is the fire-proof qualities of the fabrics used. It has been proved that a fabric with pile burns far more readily than a closely woven one. This is easily understood since the pile consists of exposed fibres through which the air can circulate. It has also been found that wool, silk, nylon, vinyon or velon fabrics present no fire risks because their individual fibres melt and exclude the air. On the other hand, cotton, rayon and pyroxylin-coated fabrics will burn readily. It is generally if not always possible, however, to give a fireproofing treatment to materials not naturally fireproof by the use of ammonia or other salts, but in this case the treatment must be repeated after every dry-cleaning process.

(*Concluded on page* 197.)



AN EXCEPTION.—The Lancastrian is one of the very few satisfactory bomber-conversions. There is just room for two rows of armchair seats without cramping and the type has the advantage of very high speed.

Water Gliders

An Ingenious Means for Preliminary Research at High Incidence

By C. G. W. EBBUTT*

THE startling progress of the last few years in all matters concerning flight at high speed has rather tended to swamp the relatively small amount of progress at the soggy end of the speed range. I mean by this that there is a tendency everywhere to take it for granted that nothing can be done at all unless it be on the grand scale. This outlook I believe to be quite unsound, and I take the liberty of giving my reasons.

As far back as 1936 I constructed a simple model which was used as a free glider completely submerged in water. The model, which is shown in Fig. 1, was trimmed to glide gently into the stall so that changes in flow within the boundary layer as well as in depth could be observed by means of silk threads attached to pins stuck into the wing. This was done for four model wings, all of 2 inches mean chord and aspect ratio 6, the section being N.A.C.A. 2200 series. The first was of constant chord and thickness, the other three having a taper ratio of 0.25 and a thickness of 15 per cent at the centre and 9 per cent at the tip. Tapered wing (a) had a straight leading edge, (b) had a straight 50 per cent line, and (c) had a straight trailing edge.

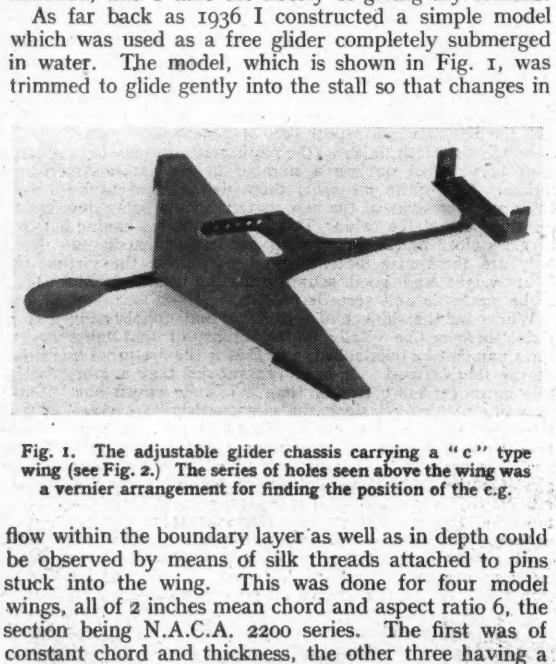
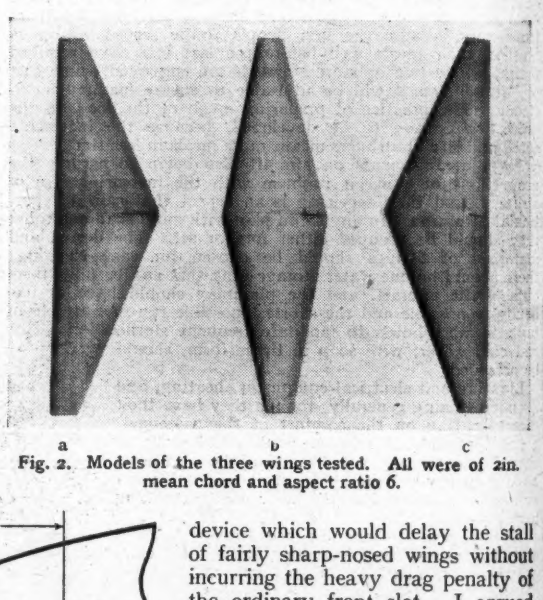


Fig. 1. The adjustable glider chassis carrying a "c" type wing (see Fig. 2.) The series of holes seen above the wing was a vernier arrangement for finding the position of the c.g.

The results of observations were systematically recorded and actually turned out to be in fair agreement with wind tunnel results reported in "R. and M." of various later dates. They also agreed with the photographic recordings made in flight by Mr. W. E. Gray at about the same time, if my memory is reliable. Fig. 2 is a photograph of the three tapered wings. The Reynold's Number of these tests was rather ludicrous, but since the full-scale stalling speeds concerned are low, this would appear to be of little importance. The really interesting thing about these water gliders was the behaviour at the stall, where the whole mechanism of wing-dropping and the incipient spin could be seen extremely clearly.

I suggest that water gliders are, for this type of work, of far greater value to demonstrators in aerodynamics at educational establishments than are small wind tunnels, since the model need not be restrained in any way and everything happens in slow-motion. The effect of wing-tip slots can be seen particularly well and, as a matter of interest, I found right at the start that breakdown or reversal of flow right on the upper surface did not necessarily indicate that the wing had stalled. This fact was not generally known at that time, but is now common knowledge. The silk threads were spaced at the surface and at intervals up each pin of one-tenth of the local chord, there being twelve pins to a semi-span and four threads to each pin. The cost of finding the plan form having the best stalling properties was a matter of shillings instead of a few thousand pounds.

An attempt was made, also in 1936, to develop some device which would delay the stall of fairly sharp-nosed wings without incurring the heavy drag penalty of the ordinary front slot. I argued that, since the large drag increment of the slot was mostly due to the input of energy into the upper air-stream, and to extra skin area, the best bet was to try to avoid losing the energy in the first place. This was done by developing, on water models, a nose flap which, full-scale, would be either hinged at the wing leading edge or slid in and out of it as if it were a rigid curved shop blind. This was intended to reduce the peak velocity on the upper surface.



a b c

Fig. 2. Models of the three wings tested. All were of 2in. mean chord and aspect ratio 6.

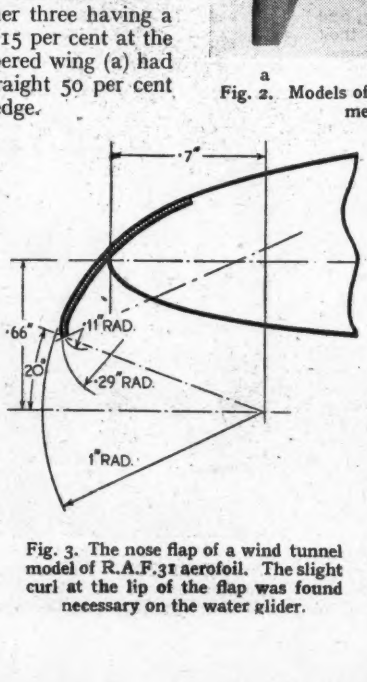


Fig. 3. The nose flap of a wind tunnel model of R.A.F.31 aerofoil. The slight curl at the lip of the flap was found necessary on the water glider.

The result was very much as expected as regards stalling properties,

* The author has been in aviation for a great number of years, many of them on the Heston Aircraft Company's technical staff.

WATER GLIDERS

and a single check on a model 48in × 8in in the wind tunnel indicated an increase in C_L max. of 23 per cent. above that of the same wing without nose flap. A sketch of the arrangement of the wind tunnel model is given in Fig. 3. Unfortunately the drag was not measured, but this example does show what can be done with very simple apparatus.

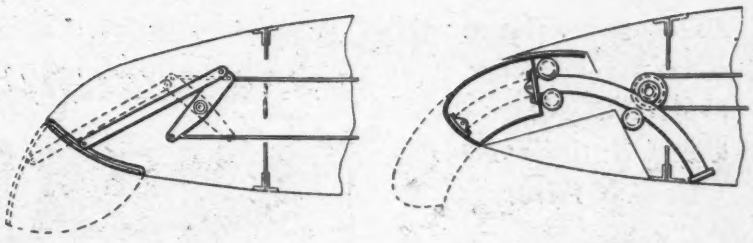


Fig. 4. Two proposals of 1937 for putting the nose flap into practice.

It is a little galling to note that the nose flap developed in Germany during the latter part of the recent war for very high-speed aircraft is virtually the same thing. I have never been able to convince anybody in this country that my flap did, in fact, work, but the validity of the German proposition has never been questioned it would seem. Perhaps I was not so silly after all! Incidentally, the nose flaps fitted at the wing tips of the model as shown in Fig. 1 completely cured the bad stalling characteristics of this particular wing.

"A prophet ——, etc."

U.S. MEDAL FOR WHITTLE

AIR COMMODORE FRANK WHITTLE has been awarded the 1946 Daniel Guggenheim Medal for achievement in aeronautics. The award is "for pioneering the development of turbo-jet propulsion of aircraft."

CONFERENCE AT CREWE

THE 1946 annual conference of the Aeronautical Engineers' Association will take place on September 1st, 2nd, 3rd, 4th and 5th at the Crewe Arms Hotel, Crewe.

As well as the sixteen usual Air Ministry establishments which will be represented, delegates representing each of the three Government Corporations' employees and Skyways, Ltd., the Charter Company, will be present.

Civilian air bases to be represented are Hurn, Croydon, London Airport (Heathrow), Northolt, Langley (Bucks), Bovingdon (Herts), Speke, Aldermaston (B.O.A.C. flight training school), Hythe, Whitchurch and Dunsfold (Skyways), Surrey.

Amongst the recommendations being put forward by the management committee are those dealing with higher benefit payments, freedom from political affiliation, a united sick and pensions fund proposed to cover all workers in civil aviation, and a proposal to affiliate to the Federation of Independent Trades Unions.

BUILT-IN CABIN COMFORT

(*Continued from page 195*)

Comfort is not only a matter of correctly-proportioned, well-upholstered seats and other purely physical considerations. The psychological effect of a colour scheme is a very well recognized factor in giving the passenger a sense of restfulness. It would be rash to try and lay down any hard and fast rules about the exact colours to be used and where to use them, but the great point to remember is that "cool" colours (such as blues and greens) should be used for the larger areas as a general background, and the "warm" colours (reds and yellows) applied with restraint to relieve the monotony. A cabin, like any other room, decorated exclusively in "cool" colours can be rather depressing after a time, just as one overburdened with "warm" tones can engender a sense of irritation.

Lighting falls in much the same optical category as the colour scheme, but this was dealt with in *Flight*, April 18th last, and can be briefly summarized here by saying that the passenger's eye-comfort depends mainly on even illumination throughout the cabin; sharp contrast should particularly be avoided between adjacent areas, and in any case the limit of variation, even between widely separated areas within the cabin, should be 10 to 1.

For the rest, the well-being of the passenger can be lessened or increased by a whole number of small details. The bell-push to summon an attendant, for instance, should be readily visible and within easy reach, but it should be countersunk so that it cannot be pressed by accident. A rack containing current magazines placed accessibly to all passengers, and the provision of drinking water are just two more typical amenities that will be appreciated. If it is considered that the passengers might be provided with radio, let it be by individual headphones so that the respective devotees of boogie-woogie and Beecham will not drive each other to the verge of homicide. It has even been suggested that long-distance airliners might be equipped with a small cinema, but this seems to be going a shade too far, apart from the technical snags. Since it would presumably entail darkening the cabin, even a silent film would force the show on everyone whether he wanted it or not.

BEAMONT JOINS D.H.

WING CDR. R. P. BEAMONT, D.S.O., D.F.C., and American D.F.C, who has been a test pilot with the Gloster Aircraft Co, Ltd., since leaving the R.A.F., has now left this firm and joined the de Havilland Aircraft Co., Ltd., in a similar capacity.

During the flying bomb phase of the war's closing stages, Wing Cdr. Beamont led the top-scoring Tempest Wing against these missiles. He was taken prisoner on the Continent in 1944, and received his American decoration in May of the present year.

T. G. JOHN

IT is with regret that we have to announce the death of Mr. T. G. John, late chairman and managing director of Alvis, Ltd., after a long illness. It is through his connection with the manufacture of aircraft engines during the war that Mr. John was best known, but his association actually goes back to the first World War, when he was chief engineer to Armstrong-Siddeley, who were at that time making the Puma engine. In 1919 Mr. John founded his own firm, T. G John, Ltd., which became a public company in 1921 under the title the Alvis Car and Engineering Co., Ltd., with Mr. John as the first chairman and managing director.

DEATH OF SIR JAMES BIRD

BRITISH aviation circles have learned with sorrow of the tragic death of Sir James Bird from heart failure. The fact that he was found with shot wounds at first indicated that his gun might have gone off accidentally as he was climbing a fence, but at the inquest the Coroner returned a verdict of death from natural causes. Sir James, who retired but recently, had suffered from heart disease and had been under treatment by a specialist.

With the passing of "Jummy" Bird British aviation has lost one of its picturesque figures. After a career in shipbuilding, he joined the Royal Naval Air Service in the first World War, and retired in 1918 with the R.N.A.S. rank of squadron commander. The following year he joined Mr. Hubert Scott-Paine as a director of the Supermarine Aviation Works at Woolston, and in 1923 he acquired a controlling interest in the firm. Five years later he sold the business to Vickers-Aviation and became a director of Vickers-Armstrongs.

In addition to his business interests, Sir James Bird did much work for the Society of British Aircraft Constructors, being a member of the council for 25 years, deputy chairman for two years, and hon. treasurer for a time. It was largely due to his enthusiasm and willingness to spend money on racing seaplanes that Great Britain won the Schneider Trophy Seaplane Contest. Members of the British aviation community, especially those of the older generation who knew him so well, will sadly miss the cheery personality of "Jimmy" Bird.

I.A.T.A. Conference Recommendations : Official News of Constellations : New British Aircraft

FIRST CZECH. The Dc 3 at Croydon after flying from Prague to London to initiate the Czech Airlines regular service. Sir Harold Hartley, chairman of B.E.A., met Mr. Trebicaavsky, president of C.S.A., who flew in the aircraft.

CIVIL AVIATION NEWS

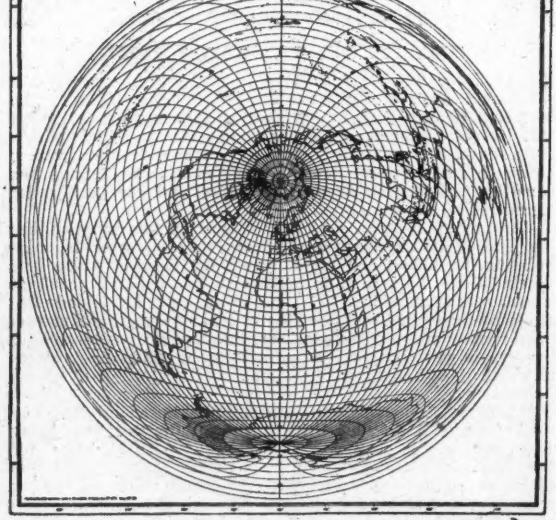
UTILIZING GOODWILL

AS a result of the Civil Aviation Act, B.E.A.C. are absorbing many British private airline companies with long experience in air transport. The goodwill of personal experience is also being absorbed in the Corporation, and the latest appointment is that of Cdr. G. O. Waters as manager of the English Division, which is responsible for the internal air lines.

Cdr. Waters was connected with Imperial Airways in 1929 and later became general manager of Jersey Airways. After serving with the Royal Navy during the war, he became managing director of Channel Island Airways. With such a background of experience in civil aviation, the new manager is well equipped for building up the network of air services to be operated in England.

AZIMUTHAL EQUIDISTANT PROJECTION

THE hydrographic department of the Admiralty have produced, with scientific precision, a new chart of the world designed to meet the requirements of air navigators, radio engineers and meteorologists. There is nothing new in this projection, but hitherto only approximate maps have been produced on it. The calculations for the graduation are laborious even with mechanical aids.



THE HUB. Some interesting great-circle routes from London may be drawn on this new Admiralty chart.

The chart was produced by drawing a semi-circle of the graduation, which was reversed by photography to obtain a complete circle. For this semi-circle over 1,600 inter-sections were computed, each of which had to be plotted independently. The curves of latitude and longitude were then drawn through these points; each 5 deg. shape was subdivided into degrees by fine pencilled lines, and the main part of the outline transferred by the method of "similar squares" from larger Mercator charts. It was not possible to use that method for places at the antipodes of London, and a further large number of positions had to be computed before New Zealand, with its adjacent islands, and part of Australia, could be drawn.

The usefulness of the chart lies in the fact that, for the first time, the exact bearing and distance, by the shortest route, of any place in the world from London can be measured.

PRACTICAL RECOMMENDATIONS

SIR WILLIAM HILDRED, the Director-General of I.A.T.A., commenting upon the results of the technical conference at Stockholm which has just concluded, said that in his opinion the cause of safer and more economical air transport had been advanced by two years, and he added that the delegates had done, in effect, a massive job of technical digestion. Three weeks of exhaustive survey have produced many recommendations for the Governments and airlines concerned. The standards proposed by P.I.C.A.O. were the centre of the discussions, and the recommendations of this sub-committee will be communicated to the Organization. There was a predominating desire throughout the conference that the experience gained in military aviation during the past seven years should be made available to civil aviation without delay. Many of the recommendations were highly technical, but some of the major proposals may be reviewed.

The recommendation was made that responsibility for the separation of air traffic, presumably the establishment of air lanes, should be left with individual Governments, whereas the actual flight, and circuit and landing control should be the responsibility of the operating companies. The use of radar was suggested for the control of traffic in the crowded zones. Regulations were requested for establishing a high standard of proficiency among airline personnel, allowing flexibility for rapid development in flight equipment and techniques. This request was not confined to aircrew, as a similar suggestion was made for weather forecasters, aeronautical ground station radio operators and other ground personnel who should, it was considered, hold proof of competency.

Each international airport should have, in the opinion of the conference, charts for a standard approach procedure drafted after agreement between the operating companies. It was considered that this would reconcile more efficiently the difficulties which may be experienced with equipment and techniques than if arranged by P.I.C.A.O. Long-range flying over heavily used routes was also covered, with an urgent request for navigational plotting charts, and general specifica-

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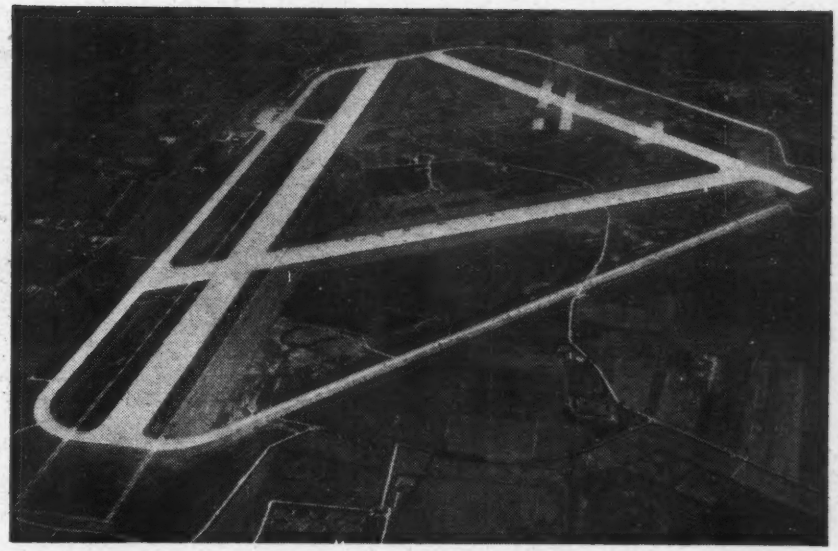
tions were outlined for the inclusion of the details of radar aids on these charts.

On the subject of airports and ground aids, the delegates considered the use of heavier aircraft in the future, and the necessarily larger airfields which would be required. Many of the present-day main airports would be inadequate, and it would be necessary to enlarge them and provide more ample landing facilities. Approach and landing systems should be compulsory equipment at all international airports, and it was recommended that very high intensity runway and approach lights should be installed for use during poor visibility periods.

Agreement was reached on several points concerning standardization of the minimum requirements for airborne radio equipment, and the conference recommended that in order to meet the common needs of international operators it was desirable to pool international communications. The airlines were to make their own arrangements for the types of safety equipment to be carried on board aircraft, but it was recommended that Governments should be responsible for surface protection arrangements. Disagreement with P.I.C.A.O. featured on the subject of meteorology, by preferring an alternative to the P.I.C.A.O. system of classification of the route forecasting service based on distances and routes. The alternative recommendation being a classification on the basis of the type of meteorological service provided.

The P.I.C.A.O. system does not allow for the varying characteristics of flight of different aircraft over the same route, whereas the I.A.T.A. recommendation will provide for different aircraft obtaining different met. services for identical routes in accordance with their requirements, which may vary considerably. This is particularly important in view of future developments in the speed of aircraft and the heights at which they will fly. With certain suggested modifications, the conference approved the newly developed international code.

As announced in *Flight* of July 25th, the conference was under the chairmanship of Mr. A. C. Campbell-Orde, the assistant to the Chairman of British Overseas Airways.



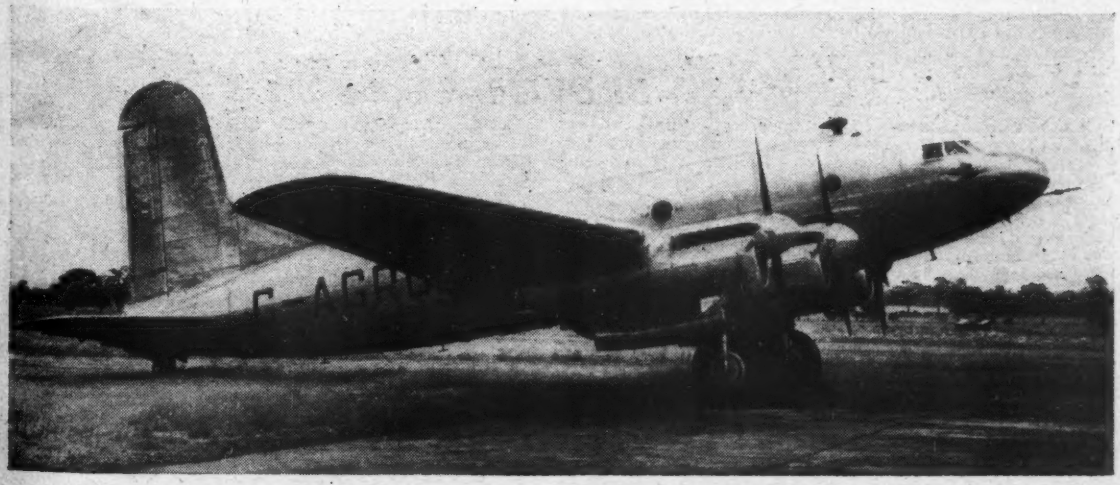
LONDON AIRPORT PROGRESS: A new photograph of Heathrow showing the present state of the runway construction. Considerable progress has been made recently.

FUNDAMENTALLY SOUND

B.O.A.C. are not yet able to forecast a definite date when the Constellations will be back on the transatlantic service, but Trans-World Airlines have announced that their Constellations will be flying again on the routes on September 1st.

The principal modifications have now been announced and are as follows: (1) Replacement of bulkhead electrical connectors by re-designed assembly, and of aluminium conductors in generator circuits by copper cables; (2) insulation of circuit breakers to eliminate shorting, or their replacement with copper fuses; (3) additional fire extinguisher protection in the rear section of the power plant installation; (4) installation of improved exhaust collector rings. There are also some other changes which involve re-design of certain items in the electrical and hydraulic systems.

It is understood that the manufacturers will flight-test the aircraft before Constellations are permitted to go into service, and subject to these tests being satisfactorily completed, that improved operating and maintenance techniques for carburettor engines will be incorporated in the operating certificates of the airlines. The C.A.A. has also approved the programme agreed to by airlines and manufacturer for the pro-



TALL-TAILED TUDOR: The Avro Tudor II with its new tail unit has already made public appearances. This new view shows how a similar tail has now been incorporated on the Tudor I. The remarkably clean installation of the four Rolls-Royce Merlins is also apparent.

CIVIL AVIATION NEWS

gressive modification of Constellations to incorporate fuel injection engines, and considers the Constellation design to be fundamentally sound. With the modifications there will be no hesitation in approving the aircraft for public use, and certificates will be issued.

DESIGNED FOR GAS TURBINES

THERE is considerable satisfaction in the announcement that a genuine gas-turbine powered airliner has been designed in Britain and a contract has been placed. What stage the construction has reached is not known, but some details of the design have been released.

The aircraft, designed and constructed by Armstrong-Whitworth, is an orthodox low-wing monoplane with circular fuselage and tricycle undercarriage, the whole of the interior of the fuselage being pressurized and air-conditioned. Normal accommodation for twenty-four passengers is provided, with adequate space for baggage, and for shorter flights the numbers may be increased to thirty.

The Brabazon IIB, as this new British aircraft is to be named, is powered by four "Mamba" engines. Little is known of the "Mamba" either, except that it is a moderately powered gas-turbine. It is understood that this civil airliner, with an all-up weight of 35,000lb, will have a range of over 1,000 miles, at a cruising speed in excess of 300 m.p.h. It is expected to have a high safety margin of power, providing a rapid take-off and exceptional climb.

BRABAZON IIB. An impression of the new Armstrong-Whitworth medium sized transport aircraft, powered by gas turbine airscrew units.

CROYDON IS BUSY

ALTHOUGH several of the foreign airline companies have recently moved to Northolt, there are still a large number of schedules running to and from Croydon. It is also, of course, the port of call for many of the charter companies, who are very busy flying for private hire, helping out the Corporations, and also, rather ironically, flying members of the Government on urgent business.

The aircraft movements vary from 150 to 250 a day. Unfortunately the pre-war figures are not readily available, but those who should know estimate that Croydon is working at approximately 90 per cent of its pre-war intensity, and there is about 40 per cent more freight passing through the terminal.

Some anxiety is felt by the charter companies about hangar accommodation for the winter, as rebuilding the bombed buildings is making little headway. There is a hope, however, now that the Accidents Branch has been transferred to the Civil Ministry, that the hangar space occupied by the Inspector of Accidents will be put to better use by clearing out some of the debris and making room for aircraft.

WHERE YOU MAY REFUEL

FROM time to time we have published lists of airfields where aviation spirit is available for resale. Below is the latest list, amended to August 15th, with the octane numbers and the names of the retailers:

Airport	Octane Stocked		Retailer
Broxbourne	87	73	Herts. & Essex Avn.
Cambridge	..	73	Marshalls Flying School.
Carlisle (Kingstown) ..	..	73	British Air Transport.
Croydon 100	87	73	Petroleum Board.
Derby	87	73	Air Schools.
Fairoaks	..	73	Air Training.
Guernsey	..	73	States of Guernsey.
Hanworth	..	73	London Air Syndicate.
Hurn 100	87	73	Petroleum Board.
Jersey	87	73	States of Jersey.
Luton	87	73	Luton Corporation.
Lympne	87	73	Field Consolidated.
Macmerry (Edinburgh)	..	73	Edinburgh Flying Club.
Newtownards (N. Ireland)	..	73	Miles Aircraft.
Northolt 100	87	73	Petroleum Board.
Oxford	87	73	Air Training (Oxford).
Perth	87	73	Airwork.
Peterborough	..	73	Morrisons Aircraft Services.
Prestwick .. 100	87	73	Petroleum Board.
Portsmouth	87	73	Portsmouth Aviation.
Ringway 100	87	73	Petroleum Board.
Ronaldsway	87	73	W. H. Kinwig, Ltd.
Rearsby	..	73	Auster Aircraft.
Shoreham	..	73	Brooklands Aviation.
Speke	..	73	Ministry of Civil Aviation.
Southampton (Eastleigh)	87	73	Southampton Corporation.
Sherburn	87	73	A. G. Wilson, Ltd.
Tollerton	87	73	Tollerton Aircraft Services.
Walsall	87	73	Helliwells.
Whitchurch .. 100	87	73	Petroleum Board.
White Waltham ..	87	73	West London Aero Club.
Wolverhampton ..	..	73	Wolverhampton Flying School.
Woodley (Reading) ..	87	73	Miles Aircraft.
Weston-super-Mare ..	87	73	Western Airways.

BREVITIES

Pan American Airways have announced that their affiliate in South America, Panair do Brazil, started a weekly service on August 9th from London to Rio de Janeiro, using Skymasters.

* * *

S.A.B.E.N.A. have announced that an additional service has started between London and Brussels, leaving Croydon at 08.30 to connect with the new Brussels-Nice service. This Brussels-London early morning run will also give connections to many of the other S.A.B.E.N.A. services, including those to South Africa and New York, the latter being run, for the next ten weeks, at a frequency of one per week. The regular and more frequent DC-6 service to New York is expected to start early in 1947

* * *

Swissair have announced that in the second quarter of 1946 the schedules maintained 100 per cent regularity. In the first quarter the percentage was 98.6.

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A. K.L.M. Skymaster has left Amsterdam for a test flight to South America, carrying thirty passengers. After two more test flights K.L.M. intend to start a regular service to South America, which should be some time in October.

B.O.A.C. have announced that there has been a reduction in the fares on some routes, and the reintroduction of return tickets on all routes.

* * *

Trans-World Airlines have received permission from the Civil Aeronautics Board to extend their services beyond Bombay to Shanghai, via Calcutta, Mandalay and Canton.

* * *

The flying-boat service between Bermuda and Baltimore is to continue operations with the existing Boeing flying-boats, but consideration is being given to the possible use of Sunderland Vs, which, when they become available, will be named "Plymouths."

* * *

The first flight since the war from London to Berlin by a civil aircraft was made on August 14th by a British European Airways' Dakota. The Corporation expect to start a regular London-Berlin service in the near future.

* * *

Czech Airlines flew their first Prague-London service on August 8th. This service will be run three days a week in each direction.

CORRESPONDENCE

The Editor does not hold himself responsible for the views expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

"JOE ERK" REPLIES

Aircrews Showed Their Appreciation

I HAVE read the recent letters addressed to "Joe Erk," and as one who worked in this capacity during wartime I should like to say "Thank you" to your correspondents.

Our work was sometimes tiring and the hours long, but we had interest in our "kites" and, of course, in the crews. Their job was more hazardous than ours, and it was up to us to make their task assured so far as efficiency of the aircraft was concerned.

I was on 467 Australian Lancaster Squadron and thoroughly enjoyed the occasional evenings out, with various crews, to celebrate their completion of a "tour."

During the period of "ops" their thoughts were on the job in hand, but they showed their appreciation in various ways. Many times I have had a share of their chocolates or

A "Grand Kite" which was nursed through 74 ops.

sweets which they professed not being able to eat whilst in the air. Also I enjoyed the pow-wows we had together before take-off. We were small "cogs" in a great organization which, with team work, helped this country to victory. That is what we were all striving for.

If any of the crews of *Der-Tag* should read this, I should like to thank them for nursing a grand kite through 74 operational trips. (This is not claimed as a record, as our "S Sugar" did well over 100 trips.) I am enclosing a photo showing our "doodle-bug" monogram and I should like to see others printed showing their motto or insignia.

In closing, I should like to say good luck to all you aircrew boys, and God bless! "RIGGER ERK."

DOUGLAS XB-42 AND XB-43

IN your "Correspondence Column" of your August 8th issue I was somewhat hurt to see the unkind manner in which you shot down Christopher Clarkson in flames.

Although perhaps not generally known, Christopher Clarkson was for some time the senior R.A.F. pilot in the British Air Commission at Washington during the war, and as such his chief task was to obtain all the latest information on American projects, and I should think his knowledge on this subject is second to none.

I was sent out on a mission to America to study and fly jet projects at the time the XB-42 and XB-43 were still in the constructional stage, and I assure you they were laid down as sister ships and as a combined project.

As you state, the idea was based on the Mosquito, i.e., the design of a very fast unarmed light bomber.

When the project was first visualized, only the Bell P-59 jet fighter was being flown in the States, and even then under conditions of great secrecy, and therefore Douglas very rightly decided to carry out the experiment with alternative forms of propulsion.

You are quite right to say that the XB-42 flew very much earlier than the XB-43, but the reason for this was the delay in the perfection in the jet units required for the latter aircraft.

I think you will further find that there has been a great deal of delay in the development of many other American jet-propelled aircraft owing to non-delivery of the jet units, and it is for this very reason, I think, that certain American designers would very much like to see such engines as the Rolls-Royce Derwent being built under licence in the States.

TEST PILOT.

P-51F LIGHTWEIGHT MUSTANG

Design Detail is a Specialist's Job

"STRESSMAN'S" letter (*Flight*, August 8th) re the lightweight Mustang illustrates perfectly the great importance of weight saving in detail design. As this happens to be a major foible of mine, I was very glad to see it published and hope it will be digested by everyone engaged in aircraft design.

It is perhaps regrettable that aircraft firms as a whole do not pay more attention to detail design. It is a matter left mainly to the individual detailer, and/or the section leader, neither of whom may give much thought to the matter. I should like to see it placed in the hands of a specialist who would make a study of the whole business, as I believe is done in the U.S.A. The individual draughtsman has neither the time nor the opportunity to weigh up the pros and cons of any proposed weight saving. It is generally a matter of weight v. cost, and it is almost impossible for him to ascertain the cost of a detail.

Again, a draughtsman may wonder which is the best way to make a fitting, to have it cast, forged, machined, or fabricated. He does not know, but a specialist would.

Incidentally, it can be proved that merely using fractional dimensions instead of decimals increases the total weight of a machine by approximately 5 per cent (it is so natural to call 0.23in ¼in).

If 500 lb can be saved on a Mustang, what can be saved on, say, a 100-tonner? A. S. MUNDAY.

COST OF FLYING

Ten Years' Experience with a Moth

IF my figures are any help to J. H. R. (*Flight*, August 8th) in regard to the expense of keeping a light aircraft, in this case a D.H. 60M Gipsy I Moth, I can give approximate costs over a period of ten years—the approximations are not so wide of the mark, either.

Here they are:—

	£	s	d
Cost of petrol and oil p.a. at average of 85 hours p.a.	61	10	0
Average cost of C. of A. p.a.	26	10	0
Rent of landing ground p.a.	12	0	0
Parts for mods. for period of ten years, say p.a.	0	10	0
Registration fee p.a.	5	0	0
Pilot's licence, "A"	0	5	0
Total	105	15	0 p.a.

Provided an "A" licence owner is keen enough to do his own maintenance, there is no expense for top-overhauls, adjustments, and most mods. In my own case I did three Cs. of A.—cutting out three years of the ten's expenses—by getting my work signed in the log-books by an ABCD-licenced engineer.

In conclusion, I would emphasize that economies can only be exercised by an "A" licence pilot-owner.

F. S. SYMONDSON.

FORTHCOMING EVENTS

Aug. 22nd.—Model Engineer Exhibition opens at the New Horticultural Hall, Vincent Square, Westminster, London, S.W.1 (11 a.m.).

Aug. 25th.—St. Albans Model Aero Club Rally, Radlett Airfield.

Sept. 9th.—Ministry of Civil Aviation demonstrations of technical radio equipment.

Sept. 12th-13th.—S.B.A.C. Flying Display and Exhibition, Handley Page Airfield, Radlett, Herts.

ALL-STAR CAST : The Lancasters of No. 35 Squadron cruise over Los Angeles on August 1st, representing Great Britain in celebration of the 39th Anniversary of the U.S. Army Air Forces. General Spaatz has paid tribute to the Squadron's efficiency.

SERVICE AVIATION

Royal Air Force and Naval Air Arm News and Announcements

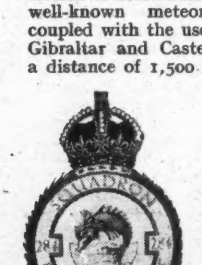
10,000-Mile Training Flight

SEVEN aircraft from the Empire Air Navigation School, Shawbury, Shropshire, completed on August 11th a navigation training flight of 10,000 miles, which was accomplished in thirteen days. They left Shawbury on the morning of July 30th and flew to Gibraltar in eight hours, covering about 1,550 miles. En route they practised a new navigational method known as "pressure pattern flying" in the Atlantic, well to the west of the Iberian Peninsula. Pressure pattern flying is a collection of individual techniques based on well-known meteorological principles, coupled with the use of radar. Between Gibraltar and Castel Benito, in Libya, a distance of 1,500 miles, they executed other tests in the Mediterranean to the west of Sicily.

The next hop, of 1,750 miles, over the Sahara desert to Khartoum called for exact navigation in an area where there were no radar and few radio or landmark aids. Then the 1,100-mile flight down the Nile Valley to Almaza (Cairo) was accomplished in about six hours. The return was made via Castel Benito and Gibraltar to Shawbury, which five aircraft reached by 5.30 a.m. on the 11th. One Halifax landed at Shawbury at 2 p.m., but another was delayed at Gibraltar.

One Lancastrian accompanied the formation of Halifaxes on the flight.

The Officer Commanding the mission was Wing Cdr. C. M. Dunnicliffe, D.S.O., D.F.C.



Badge of No. 284 Squadron, Royal Air Force—"From the Deep."

Badge of No. 117 Squadron, Royal Air Force—"It Shall be Done."

Chaplain-in-Chief to Tour

THE new R.A.F. Chaplain-in-Chief, Air Vice-Marshal the Rev. J. A. Jagoe, will shortly visit two R.A.F. stations in Scotland as the beginning of a tour of stations at home and abroad. On Sunday, August 11th, he conducted the service at Leuchars, and on the following Tuesday visited Kinloss, Morayshire.

With the discontinuance of compulsory church parades in the Service, and the return to peace-time conditions in the R.A.F., the Chaplain-in-Chief wishes to discuss with chaplains their problems and how best to minister to the religious needs of the men. The University of Dublin recently conferred on him the honorary degree of Doctor of Divinity—the first time that the degree has been conferred on the Chaplain-in-Chief of the R.A.F.

R.A.F. and W.A.A.F. Releases September—October

ADVANCE notification of the release programme of the R.A.F. and W.A.A.F. for September and October has now been made to the service. The releases to be effected in each of the two months will be notified later. The general level of release for ground airmen will be Group 45. In a number of ground trades, however, airmen in age and service groups up to and including Group 46 will have been released by the end of October. In some trades releases will not have reached the Group 45 mark, but all of these will have reached the Group 40 mark. The general level of release for airwomen is raised to Group 49. Some trades will not reach this general level whilst a number will reach Group 50.

Aircrew, both officers and airmen, will be released up to and including Group 48. The general level of release for ground officers of the R.A.F. is Group 43 and for W.A.A.F. officers Group 50. Some unavoidable variations remain in groups to be released in employments in which it has not yet been possible to make good current shortages by retraining personnel from other branches and trades.

SERVICE AVIATION

Wearing of Medal Ribbons

A RECENT Air Ministry Order details the manner in which personnel of the Royal Air Force, W.A.A.F. and P.M.R.A.F.N.S. will in future wear the ribbons of orders, decorations, medals and aircrew badges when in Service dress.

A row will consist of not more than four ribbons. When more than four ribbons are worn, they will be made up to display as many complete rows of four as possible, and any remaining ribbons will be worn in a short row on top. Thus, if six ribbons (e.g. D.S.O., D.F.C. and four Campaign Stars are worn, the top row will consist of the D.S.O. and D.F.C. and the bottom row of the four Campaign Stars. If nine ribbons (e.g. C.B.E., D.S.O. D.F.C., four Campaign Stars, the Defence Medal and the War Medal 1939-45 are worn, the top row will consist of the C.B.E., the next lower row of the D.S.O., D.F.C. and two Campaign Stars, and the bottom row of the two remaining Campaign Stars, the Defence Medal and the War Medal 1939-45.

In order to ensure that no ribbon is either wholly or partly obscured by the lapel or collar, the upper row or rows will be *shortened* as necessary to display as many complete ribbons as possible in the space between the edge of the lapel or collar and the sleeve head seam. The bottom row of ribbons will be placed immediately and centrally above the flap of the left breast pocket and each succeeding row will be placed centrally above the row immediately below it except when it is necessary for any row or rows to be shortened. The space between rows will be $\frac{1}{8}$th of an inch. The length (or depth) of ribbons will be $\frac{7}{16}$th in.

When worn with medal ribbons, aircrew badges will be placed centrally above the top row. When this results in the badge being partially obscured by the lapel or collar it will be moved towards the sleeve seam to display as much of the badge as the available space allows.

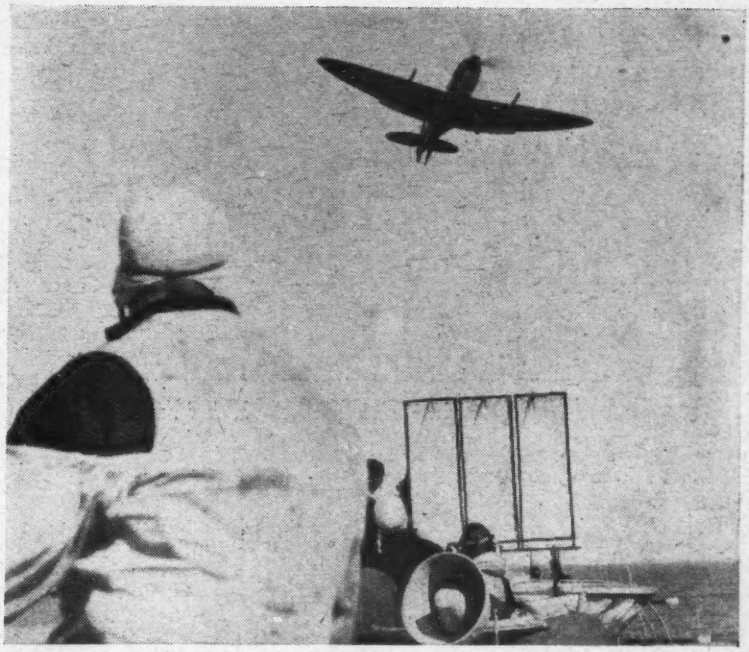
When worn with tropical service dress, ribbons will be arranged as described above but will be placed on removable bars instead of being sewn on the jacket.

The *order* in which ribbons are to be worn as laid down in King's Regulations and Air Council Instructions remains unchanged. To avoid expense personnel are only required to have ribbons changed when new uniform is purchased or ribbons of existing uniform have to be altered.

Naval Research

FOLLOWING the creation of the Royal Naval Scientific Service further measures have been approved for a reorganization designed to reflect more adequately the importance to the Navy of scientific research in its broadest sense. It has been decided to replace the existing Department of Scientific Research and Experiment by a Headquarters organization consisting of a group of departments, under the immediate charge of the Chief of the Royal Naval Scientific Service, which will deal with various aspects of research.

The following appointments have been approved: Chief of the Royal Naval Scientific Service, Sir Charles S. Wright, K.C.B., O.B.E., M.C., M.A.; Assistant to Chief of the Royal Naval Scientific Service (Reconstruction), Mr. F. Brundrett, C.B., B.A.; Director of Physical Research, Dr. J. A. Carroll, M.A., Ph.D., F.R.S.E.; Director of Aeronautical and Engineering Research, Mr. O. Thornycroft, O.B.E., M.A.; Director of Operational Research, Mr. E. M. Gollin, M.A.; Director of Research Programmes and Planning, Mr. J. Buckingham, M.A.



THE BATSMAN KNOWS THE SCORE: A Supermarine Seafire turns for a new approach after being waved off by the Deck Landing Officer, or "batsman," of H.M.S. *Theseus*, lately returned from a good-will voyage to Norway which also served as a training cruise.

R.A.F. Demonstrate at French School

ROYAL AIR FORCE units gave a demonstration for the French School of Air Support at Lindau, Germany, on Saturday, August 3. Tempests from B.A.F.O., Dakotas from Transport Command's heavy glider servicing unit and the Transport Command development unit, and Transport Command Halifaxes from R.A.F. Station, Tarrant Rushton, Dorset, took part. Group Capt. Powell, officer commanding No. 123 Wing, B.A.F.O., was in charge.

The Tempests gave a demonstration of rocket-firing with a Caudron Goeland as a target on a range near Lindau. Horsa and Hadrian gliders, towed by Dakotas, landed at Friedrichshaven, and a jeep, a six-pounder gun and four containers were parachuted from Halifaxes. A demonstration of supply dropping in a marked zone was also given, sixteen panniers being dropped by Dakotas and twelve by Halifaxes. Finally, a Hadrian glider was snatched from the ground.

The French Air Force demonstrated dive-bombing, machine gunning and parachuting troops.

Among the distinguished spectators were Air Vice-Marshal T. M. Williams, C.B., O.B.E., M.C., D.F.C., Assistant Chief of the Air Staff (Operations); Air Vice-Marshal G. Combe, Director-General of Armament, Air Ministry, and Air Commodore H. W. Mermagen, C.B.E., A.F.C., Headquarters, No. 38 Group. The Admiralty and War Office were also represented.

Cardington P.D.C. Disbanded

THE R.A.F. Personnel Dispersal Centre at Cardington was disbanded on August 1st. It was formed in May of last year to deal with airmen awaiting release and started operating on June 18, 1945, since when it has handled the demobilization of 209,500 airmen. One of five centres formed for the purpose, it completed its work on Saturday morning, July 27, when about 200 airmen obtained their release through the Centre.

The remaining R.A.F. Dispersal Centres are No. 100, at Uxbridge; No. 101, at Warton; No. 104 (Overseas), at Hednesford; and No. 105 (W.A.A.F.), at Wythall. These are fully capable of handling the decreased flow of personnel due to be released.

Dakota Accident

THE Air Ministry regrets to announce that when a Dakota of Air Command, South-East Asia, crashed during a flight from Mingaladon, Burma, to Cawnpore, India, on July 25, 1946, all the occupants were killed. The names ot the eighteen R.A.F. passengers and the crew of four are as follows:

Passengers: W/O. G. W. Cursons, W/O. W. H. Donaldson, W/O. A. E. Heap, Flt. Sgt. R. F. Treacy, Flt. Sgt. W. A. T. Scott, Flt. Sgt. C. A. Rowley, L.A/C. D. Evans, L.A/C. E. T. Tonner, L.A/C. T. S. Robinson, L.A/C. G. H.

SERVICE AVIATION

Brown, L.A/C. R. Dunlop, L.A/C. A. G. Coles, L.A/C. R. A. Sivell, A/C.1 R. Smedley, A/C.1 J. Heffron, A/C.1 C. N. Campbell, A/C.2 R. F. Enever, A/C.2 W. G. Mills. *Crew*: Flt. Lt. R. T. Church (Captain), F/O. P. C. McGhee (2nd Pilot), Flt. Sgt. A. J. Guthrie (Navigator), F/O. J. Conlon (Wireless Operator).

Roll of Honour

Casualty Communique No. 597 (Cont.)

THE Air Ministry regrets to announce the following casualties on various dates. The next-of-kin have been informed. Casualties "in action" are due to flying operations against the enemy; "on active service" includes ground casualties due to enemy action, non-operational flying casualties, fatal accidents and natural deaths.

DIED ON ACTIVE SERVICE

Cpl. H. G. Thatcher; Cpl. B. Thomas; L.A/C. A. Tidy; A/C.1 A. A. Tobutt; L.A/C. P. C. Turland; A/C.1 E. D. Turnbull; Sgt. F. G. Turner; A/C.1 E. Turton; L.A/C. E. Umpleby; Cpl. S. C. Wake; L.A/C. J. S. Walker; A/C.1 J. Ware; A/C.1 C. W. Warner; Flt. Sgt. S. L. Warner; Flt. Sgt. G. L. Waters; A/C.1 K. O. Watkins; A/C.2 W. T. T. Watson; A/C.1 W. A. Watson; A/C.2 R. F. C. Weller; A/C.2 F. G. Wells; A/C.1 T. D. White; A/C.1 C. J. Wicks; Cpl. C. Wiggin; A/C.1 J. McE. Wilkie; L.A/C. S. Williams; Cpl. A. Williamson; A/C.2 L. Wilson; A/C.1 T. W. Wilson; A/C.2 R. C. Wood; A/C.1 K. C. Woolner; L.A/C. F. C. Worsdell; L.A/C. R. Wylie; L.A/C. C. J. Youngman

Women's Auxiliary Air Force

DIED ON ACTIVE SERVICE.—L.A/CW. S. P. Boulden; L.A/CW. D. Church.

Royal Australian Air Force

MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—P/O. T. T. McInerney.

PREVIOUSLY REPORTED MISSING, NOW REPORTED DIED ON ACTIVE SERVICE.—W/O. M. McLeod.

Royal Canadian Air Force

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—P/O. R. J. Ashley; Flt. Lt. M. S. McClarty, D.F.C.; P/O. J. F. McCormick; F/O. C. R. M. Morrison; W/O. R. D Piccinno; Flt. Sgt. R. S. Rice; W/O. G. V. Walker.

DIED ON ACTIVE SERVICE.—Cpl. R. C. Neal.

South African Air Force

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED IN ACTION.—Capt. I. G. Will.

Casualty Communique No. 598

Of the names in this list 44 are second entries giving later information of casualties published in earlier lists.

Royal Air Force

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. R. B. Ball; Flt. Sgt. D. Bateman; W/O. K. C. Bevan; Flt. Lt. B. Bridge; Sgt. A. W. Cooper; Flt. Lt. J. F. Cuthbert, D.F.C.; Flt. Sgt. B. Ellis; Flt. Sgt. K. H. Goad; Act. Sqn. Ldr. R. P. B. Grotrian; F/O. T. W. Humphreys; Flt. Sgt. P. N. Hyde; F/O. A. C. Kent; F/O. J. D. Lorimer; Act. Wing Cdr. A. J. Samson, D.F.C.; Sgt. F. A. Taylor.

MISSING, BELIEVED KILLED, ON ACTIVE SERVICE:—W/O. I. W. Grainger.

KILLED ON ACTIVE SERVICE.—F/O. D. C. Beal; W/O. N. T. Beckwith; Flt. Lt. C. R. Booth; L.A/C. P. Boyd; Sqn. Ldr. R. F. Clarke; L.A/C. F. H. Clementson; F/O. E. Coatsworth; Cpl. W. H. Conner; F/O. R. R. G. Cull; Cpl. H. W. Curtis; F/O. E. E. Deyes; F/O. S. F. Dunnett; Flt. Sgt. M. O. Fardle; Cpl. W. G. E. Frost; L.A/C. D. Garvin; Flt. Sgt. H. G. Gilbey; Flt. Sgt. S. C. Griffiths; W/O. F. W. Harman; L.A/C. G. Knight; Flt. Lt. I. MacLean, D.F.C.; Flt. Lt. S. M. McCracken; F/O. A. C. Mundy; W/O. L. W. Offord; A.C.1 G. E. Rowbotham; W/O. V. T. W. Servis; W/O. H. L. Sharpley; A/C.1 H. L. Sing; F/O. R. Struthers; L.A/C. J. Ward; F/O. R. A. Wheeler; A/C.1 E. T. Wilford; Flt. Sgt. R. E. Williams; W/O. H. Woodward; Sgt. G. F. Wykes.

MISSING, BELIEVED KILLED ON ACTIVE SERVICE, NOW PRESUMED KILLED ON ACTIVE SERVICE.—L.A/C. L. K. Hill.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—Flt. Sgt. A. E. Bedwell; Flt. Lt. D. J. Cotter; W/O. E. Moore

WOUNDED OR INJURED ON ACTIVE SERVICE.—Flt. Lt. A. L. Bell; F/O. J. S. Bower; A/C.2 S. C. Bradbury; Flt. Lt. E. A. Croker; F/O. J. E. Dowthwaite; W/O. R. J. Foster; Flt. Lt. W. H. Gordon, D.F.C.; Flt. Sgt. D. F. Grigg; F/O. R. L. Hayter, D.F.M.; Sgt. J. S. Hurt; W/O. T. Johnson; F/O. I. M. Jones; L.A/C. D. A. Kemp; F/O. J. Langston; Flt. Lt. M. Mayr; Flt. Sgt. L. O. Moore; Flt. Sgt. A. W. Petter; W/O. G. W. Robinson; Flt. Sgt. A. C. Stonely; F/O. L. Todd; D.F.C.; Cpl. S. R. Waugh; F/O. A. H. Wittridge, D.F.C.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—Sgt. C. E. Kerry; Flt. Lt. H. R. Wormwell.

PREVIOUSLY REPORTED MISSING, NOW REPORTED DIED ON ACTIVE SERVICE.—Act. Flt. Lt. S. J. D. Acland; Sgt. K. R. Wyse; Act. Sgt. L. G. Young.

DIED ON ACTIVE SERVICE.—L.A/C. H. Ackroyd; A/C.1 G. W. Ainger; A/C.1 A. Allan; L.A/C. R. Anholm; A/C.1 A. L. Ansell; Flt. Lt. F. W. Ashley; L.A/C. S. V. Aspin; A/C.1 H. Atkinson; A/C.1 G. F. Austen; Sgt. E. M. Averill; L.A/C. E. W. Baker; A/C.2 S. J. Baker; L.A/C. A. G. Barlow; Sgt. S. E. Barron; L.A/C. E. P. Beale; L.A/C P. B. Behan; Flt. Sgt. C. W. Bennett; L.A/C. L. G. Bennett; L.A/C. H. Bentley; A/C.2 J. Beveridge; A/C.1 G. A. Bickley; A/C.1 C. F. Birch; L.A/C. F. C. Blake; A/C.1 G. A. Bodemeide-Burbage, A/C.2 C. Booth; A/C.1 F. Booth; Cpl. G. W. Brass; Cpl. H. B. S. Brenchley; A/C.1 H. C. Brown; L.A/C. N. J. Brown; Act. Sgt. A. C. Browning; L.A/C. G. E. Brunning; Sgt. W. Burdis; L.A/C. R. Burns; Sgt. A. J. Bushell; L.A/C. W. Butler; A/C.1 J. Cameron; L.A/C. A. Campbell; A/C.1 A. G. Canning; Cpl. G. W. Ceely; A/C.1 G. H. Chambers; L.A/C. A. S. Chapman; L.A/C. E. Chitty; L.A/C. L. Clark; A/C.1 J. W. Clarkson; A/C.2 J. P. Clement; L.A/C. W. Clough; L.A/C. H. Cohen; L.A/C. B. J. Cole; Cpl. R. T. Collins; A/C.2 J. Cottam; Act. Sqn. Ldr. S. Cox; Cpl. E. Cross; A/C.1 H. Crossling; Sgt. A. Crowe; A/C.2 K. L. Deakin; A/C.1 R. H. Denman; L.A/C. C. Dickinson; A/C.2 S. W. Dicks; A/C.2 M. G. Dickson; L.A/C. R. Dore; A/C.2 J. S. Drew; A/C.2 F. W. Duffill; Flt. Lt. C. R. Duringer; Flt. Lt. F. Duxbury; A/C.1 L. Edwards; Cpl. A. Fawcett; Sgt. H. H. Fitzgerald; A/C.1 W. Forsyth; Sgt. P. R. C. Freeman; L.A/C. R. C. W. Fuller; L.A/C. H. C. Garratt; A/C.1 R. Gedling; Flt. Sgt. L. A. Gelder; Flt. Sgt. A. G. Gilbert; A/C.2 W. Gilroy; Flt. Sgt. C. A. Goodall; L.A/C. F. Goodwin; L.A/C. S. J. Goodwin; L.A/C H. C. Gordon; Act. Flt. Lt. J. G. Gordon; A/C.1 V. E. Gordon; A/C.1 W. Gray; Cpl. T. Green; A/C.2 F. G. Groundon; F/O. H. B. Groves; L.A/C. T. A. Hales; L.A/C. R. J. Hall; L.A/C. R. H. Harcourt; A/C.2 W. E. T. Hardern; L.A/C. C. G. Harris; A/C.1 L. A. Harris; A/C.1 L. R. Harris; A/C.2 R. Hartley; A/C.2 K. E. Haswell; Cpl. H. Hawkeswood; L.A/C. G. Henderson; L.A/C. L. Heyes; A/C.1 J. Hilton; L.A/C. L. R. Holley; Act. W/O. E. F. Hore; L.A/C. R. W. Hughes; A/C.1 T. J. Hughes; Sgt. E. Idle; Cpl. E. Jones; A/C.1 G. L. McL. Jones; A/C.2 L. D. Jones; A/C.1 R. A. Johns; L.A/C. E. J. C. Joyce; Cpl. A. Kember; Wing Cmd. J. Kemper, O.B.E.; A/C.2 A. W. Kent; F/O. M. Kotkin; A/C.2 J. M. Lacey; A/C.1 R. Lee; L.A/C. F. A. Le Gassick; A/C.2 F. N. Lismund; A/C.1 J. W. Logan; Flt. Lt. L. E. Lovelock, D.F.C.; L.A/C. H. D. McKay; A/C.2 A. J. McKee; Cpl. J. McLean; A/C.2 D. D. McLennan; Cpl. G. F. Malleck; L.A/C. I. G. Mars; A/C.2 A. H. Martin; A/C.1 F. Meredith; A/C.1 G. P. Miele; A/C.1 G. G. L. Milburn; Sgt. V. H. Minns; Cpl. A. Minshall; A/C.1 C. D. Mitchell; L.A/C. W. Moore; A/C.2 G. Morgan; A/C.1 D. B. Morrison; A/C.2 E. G. Nicholson; L.A/C. R. W. Nicholson; A/C.2 H. W. Nott; L.A/C. F. M. Passey; A/C.1 H. A. Patchesa; L.A/C. K. D. G. Petheram; L.A/C. R. W. Pettit; A/C.1 A. V. Phillips; Cpl. V. C. Pitts; Cpl. J. Porter; Sgt. A. Portsmouth; A/C.2 R. R. Potter; Flt. Sgt. C. W. Potter; L.A/C. G. F. Priddle; L.A/C. V. Pryor; A/C.1 C. G. Pugh; Cpl. W. Race; A/C.2 E. F. Raven; A/C.2 R. Reid; A/C.1 O. W. Rhodd; A/C.1 G. R. Riddle; A/C.1 W. Rigby; A/C.2 P. J. Riley; L.A/C. A. Roberts; Cpl. I. Roberts; A/C.1 J. R. Robson; Act. Cpl. F. Rogers; Cpl. J. Rogers; A/C.1 J. Rogers; L.A/C. C. M. Roland; A/C.1 A. B. Rose; Cpl. A. L. Rough; A/C.1 J. See; Sgt. J. D. B. Shaw; A/C.1 L. Sheerin; A/C.1 J. A. Shine; Flt. Sgt. G. E. Shirley; Act. Flt. Sgt. A. Smith; L.A/C. H. Smith; A/C.1 C. H. Snoxell; L.A/C. C. Stanley; Flt. Lt. R. T. Spanswick; Sgt. R. P. Stannard; A/C.1 S. Stanner; L.A/C. A. T. Stapleton; L.A/C. P. C. Stapley; L.A/C. W. J. Starkie; Sgt. W. H. Stephens; A/C.2 J. B. Stewart; Cpl. W. C. K. Street; A/C.2 D. G. Strudwick; Group Capt. R. E. Taylor; L.A/C. F. R. Taylor; A/C.2 H. Taylor; L.A/C. R. J. Taylor; A/C.1 S. I. Taylor; Cpl. S. Taylor; P/O. J. A. Tebbutt, D.F.C.; A/C.1 R. L. Teppett; Sgt. J. Thomason; A/C.1 T. P. Thompson; A/C.2 J. E. Thwaites; A/C.1 J. R. Walker; L.A/C. W. Walker; Flt. Lt. S. A. Wallace; Cpl. J. W. Waller; A/C.2 R. A. Watson; Cpl. S. J. Waugh; A/C.1 J. Websdale; A/C.1 C. A. Welch; L.A/C. N. W. West; L.A/C. C. H. Westfield; Sgt. W. H. Wheatley; Flt. Sgt. C. J. Whelpton; L.A/C. C. J. Whitby; L.A/C. C. A. H. Wigley; A/C.2 C. Wild; L.A/C. G. Wilkinson; A/C.1 J. Williamson; W/O. P. C. Wood; L.A/C. R. Wood; Flt. Sgt. W. G. Wooldridge; Cpl. J. K. Yates.

Women's Auxiliary Air Force

DIED ON ACTIVE SERVICE.—L.A/CW. R. M. Aird; L.A/CW. E. M. V. Bartlett; L.A/CW. A. Irvine; A/CW.2 C. A. MacDonald; Cpl. L. B. M. Ringrose.

Royal Canadian Air Force

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—P/O. F. N. Depew; F/O. R. N. Peever; Flt. Lt. L. D. Thomas.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. C. T. Allen; Flt. Lt. J. M. Barnes; F/O. R. L. Bayard; F/O. E. S. Brenton; F/O. D. I. Cruickshank; P/O. M. L. Davis; Flt. Sgt. E. B. Gillespie; Act. Flt. Lt. J. A. Guest; F/O. M. S. Gurski; F/O. C. W. Hamann; P/O. J. A. B. Kidd; P/O. C. F. McWilliams; Sgt. C. F. Marsh; P/O. E. W. O'Donnell; F/O. W. M. Struthers; F/O. H. G. Tackaberry; Flt. Lt. E. Thurston; P/O. R. G. Vaughan; F/O. G. A. Waddell; P/O. W. A. Walker; F/O. W. A. Wallace; Flt. Sgt J. V. Willbee; W/O. B. Winter.

KILLED ON ACTIVE SERVICE.—F/O. H. J. M. Dagenais; F/O. W. R. Fee; Flt. Lt. K. S Sleep; F/O. K. F. Study; Flt. Lt. W. A. Young.

DIED ON ACTIVE SERVICE.—L.A/C. R. E. Gardiner; P/O. J. E. F. Wilkinson.

Women's Auxiliary Air Force

DIED ON ACTIVE SERVICE.—L.A/CW. E. J. Curtis.

MILITARY MOBILITY: British and American paratroops were dropped together at Beaulieu on August 9th from a Fairchild C.82 transport of the U.S.A.A.F. The C.82, or Packet, is now a standard transport in the American Service and is seen taking a 25-pounder gun aboard.